Food Tech.
36:8

FOOD Manufacture

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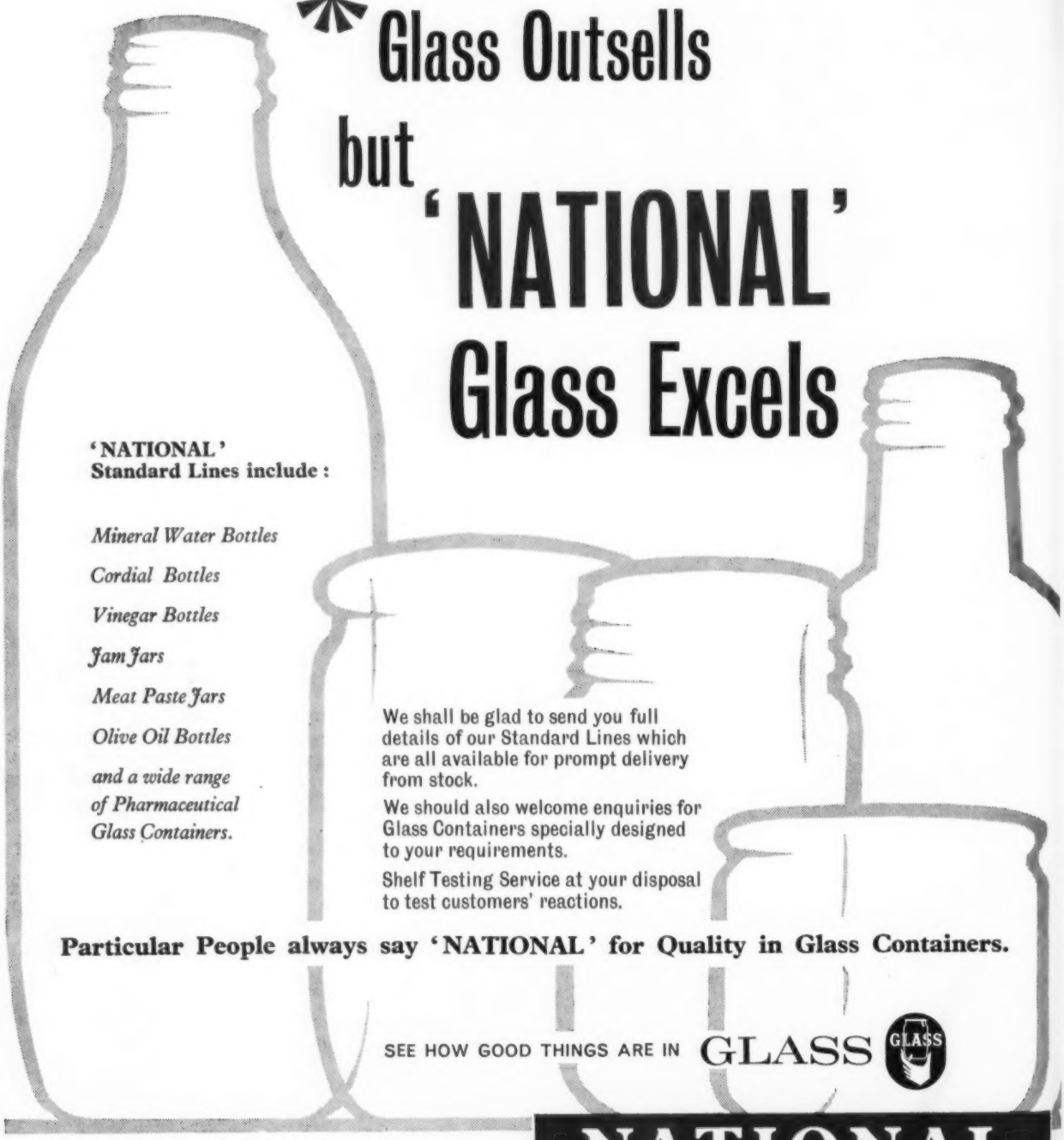
Vol. 36 No. 8 AUGUST 1961

* Glass Outsells but 'NATIONAL' Glass Excels



'NATIONAL' Standard Lines include :

Mineral Water Bottles
Cordial Bottles
Vinegar Bottles
Jam Jars
Meat Paste Jars
Olive Oil Bottles
and a wide range of Pharmaceutical Glass Containers.

We shall be glad to send you full details of our Standard Lines which are all available for prompt delivery from stock.

We should also welcome enquiries for Glass Containers specially designed to your requirements.

Shelf Testing Service at your disposal to test customers' reactions.

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London Office :
CAROLINE HOUSE, 55-57 HIGH HOLBORN. LONDON, W.C.1. Tel. HOLBORN 2146

* *Independent Research at self-service stores has shown that when identical products are offered in Glass Containers and in an alternative pack side by side, Glass outsells the other.*
May we send you full details of this most enlightening Research?

Regd Trade Mark

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**** Go to Foodtech and get Foodtech Service as well.***

**** Choose from a complete range of food processing machinery.***

Foodtech have the largest range of food processing equipment in the world, backed by expert, practical knowledge of factory layout and production methods. You can be sure of getting the right equipment and the best advice if you go to Foodtech.

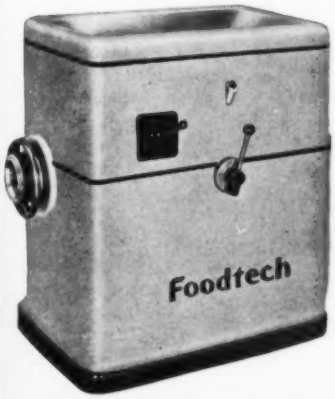
The Foodtech Cut/Mixer

—high speed (1,000/4,000 r.p.m. as desired) heavy duty chopper and emulsifier. Accepts any kind of frozen meat or other materials, cuts cleanly into particles (coarse cut) or produces a smooth emulsion. Also chops and blends fruit, vegetables and butter. Bowl capacities from 20 lb. to 800 lb.

Foodtech Automatic Filler & Linker

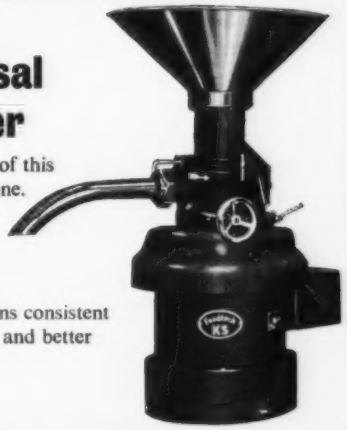
Model A.1: 60 lb. capacity, 120 sausages per minute. Straight filling too! A.L. 80: 176 lb. capacity. Up to 200 sausages per minute linked and weighed also straight filling—air, water or hydraulic—from 100 lb. to 440 lb. capacity, A.L.200: 440 lb capacity. Also available in many other sizes.

Foodtech Automatic Feed Mincer



High speed fully automatic Mincer. Outputs up to 6 tons per hour with only 18 h.p. Smaller models in many sizes.

K.S. Universal Mincemaster



Over 200 satisfied users of this machine in the U.K. alone. Accepts all foodstuffs—even the toughest—and reduces in seconds to a smooth uniform mix that remains consistent for more binding power and better colour.

Foodtech for ALL your needs

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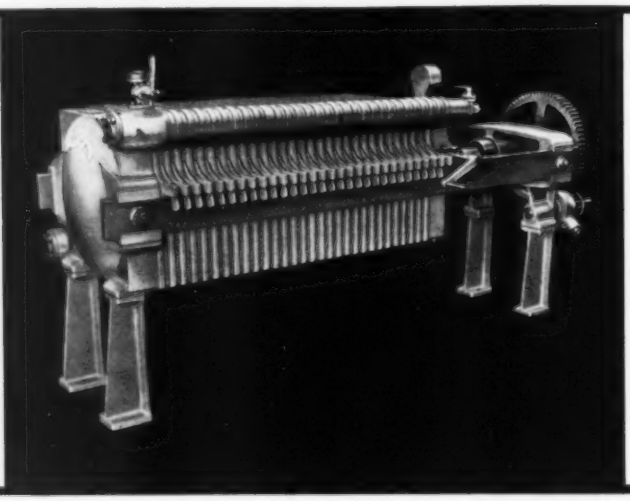

Illustrated is a Cast Iron 31½" sq. "KJ" Filter Press with a closed delivery outlet. The filter is suitable for use with a full range of filter cloths, and for polishing or additional clarity filter papers can be used. Filter Presses are also made in Stainless Steel, Aluminium, Gunmetal and Timber in a variety of designs and are provided with suitable pumping machinery.

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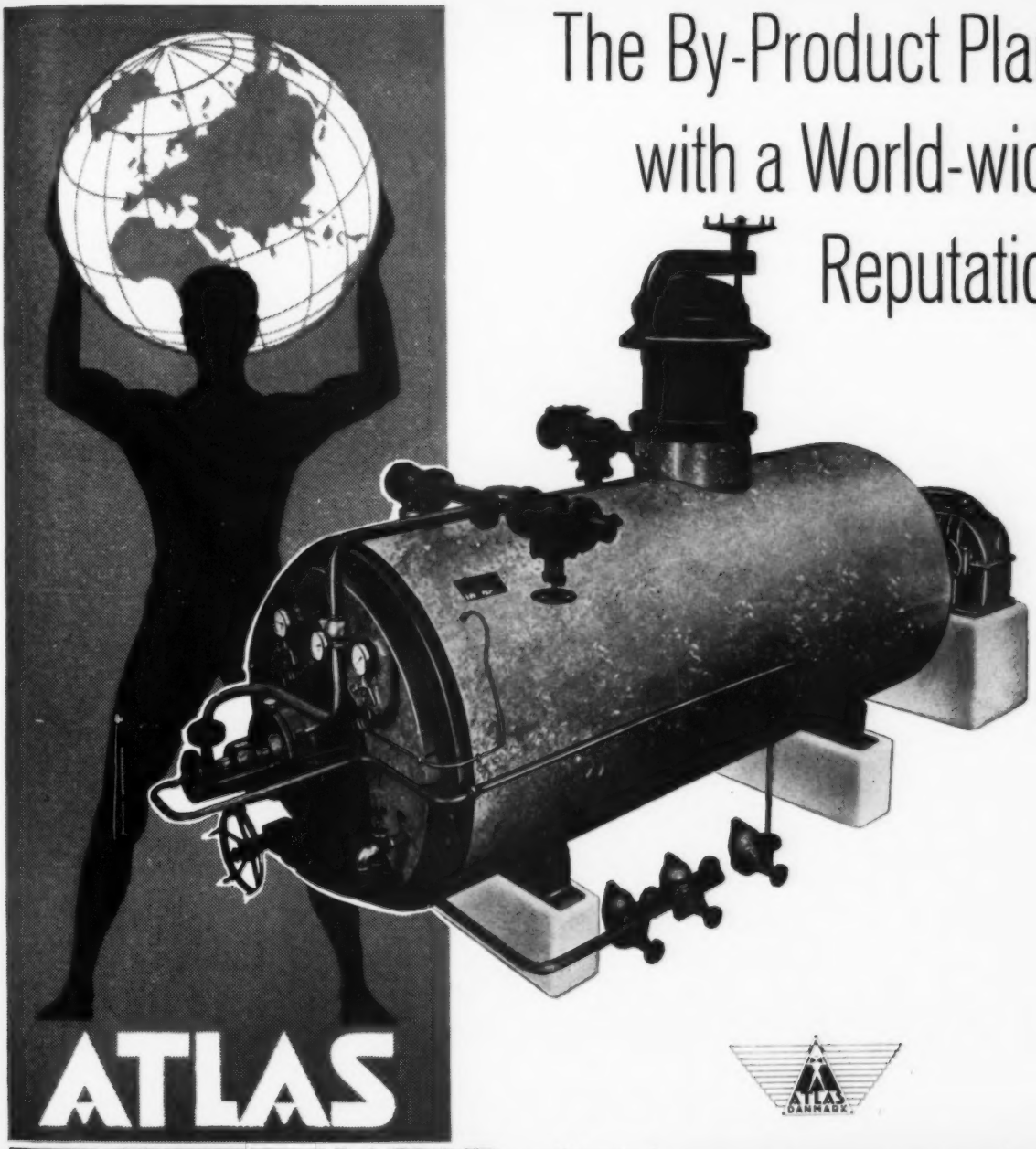

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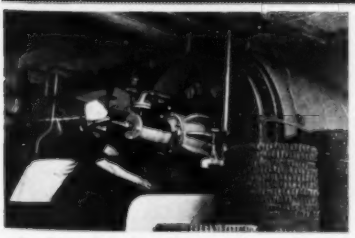
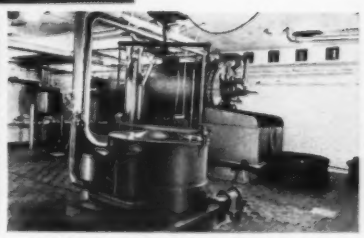


Inedible Dry Rendering Plants. For Processing: Condemned Carcasses Dead Animals, Bones, Butcher Scrap.



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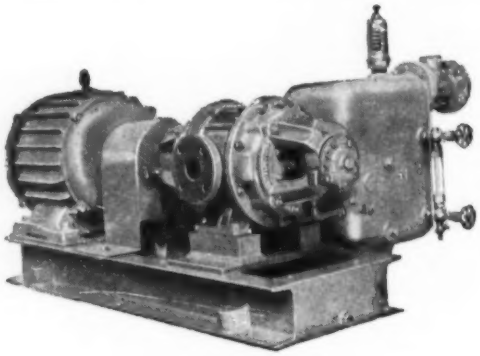

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brings Meredith & Drew a rich harvest

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Issued by the Butter Information Council

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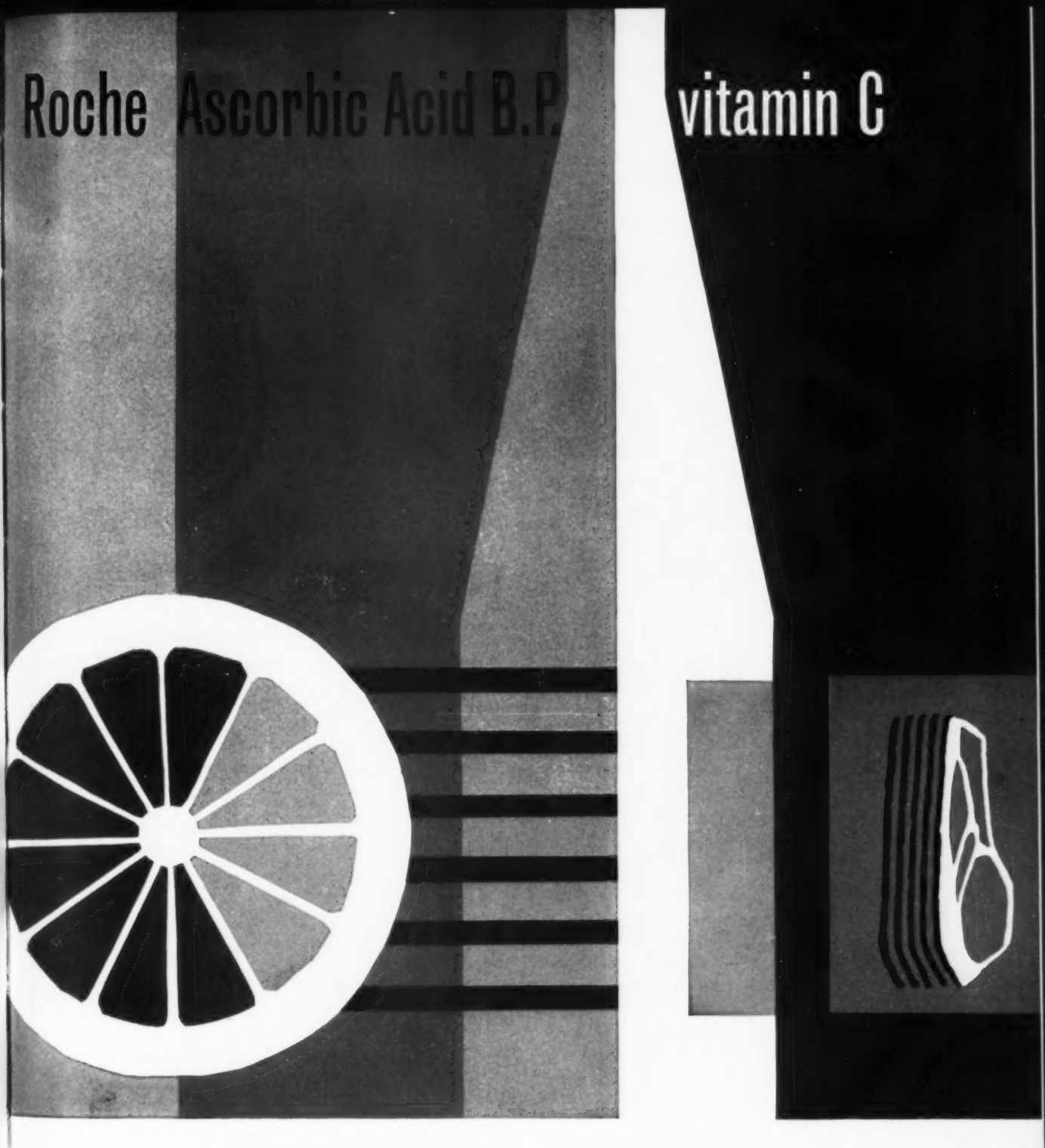

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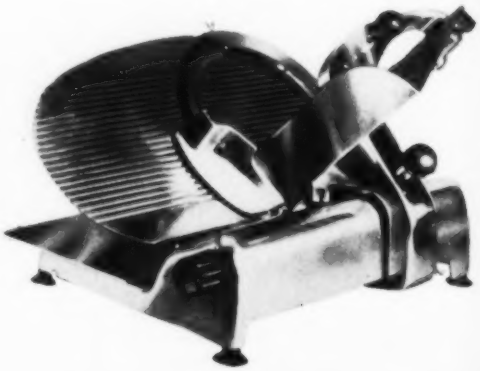
WHETHER YOU THINK OF YOUR GROSS OUTPUT IN **LBS..**



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Three typical examples of smaller machines from the Percy Dalton range. Each is a superb piece of precision engineering, embodying many advanced technical features, yet reasonably priced. Ideal equipment for the smaller producer aiming at increased production and lower cost per unit.

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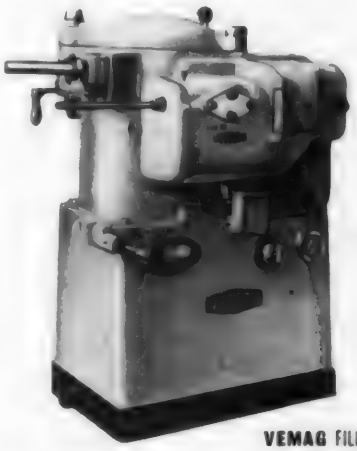

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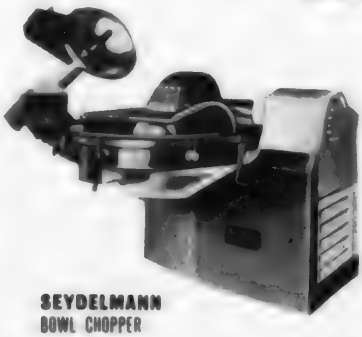

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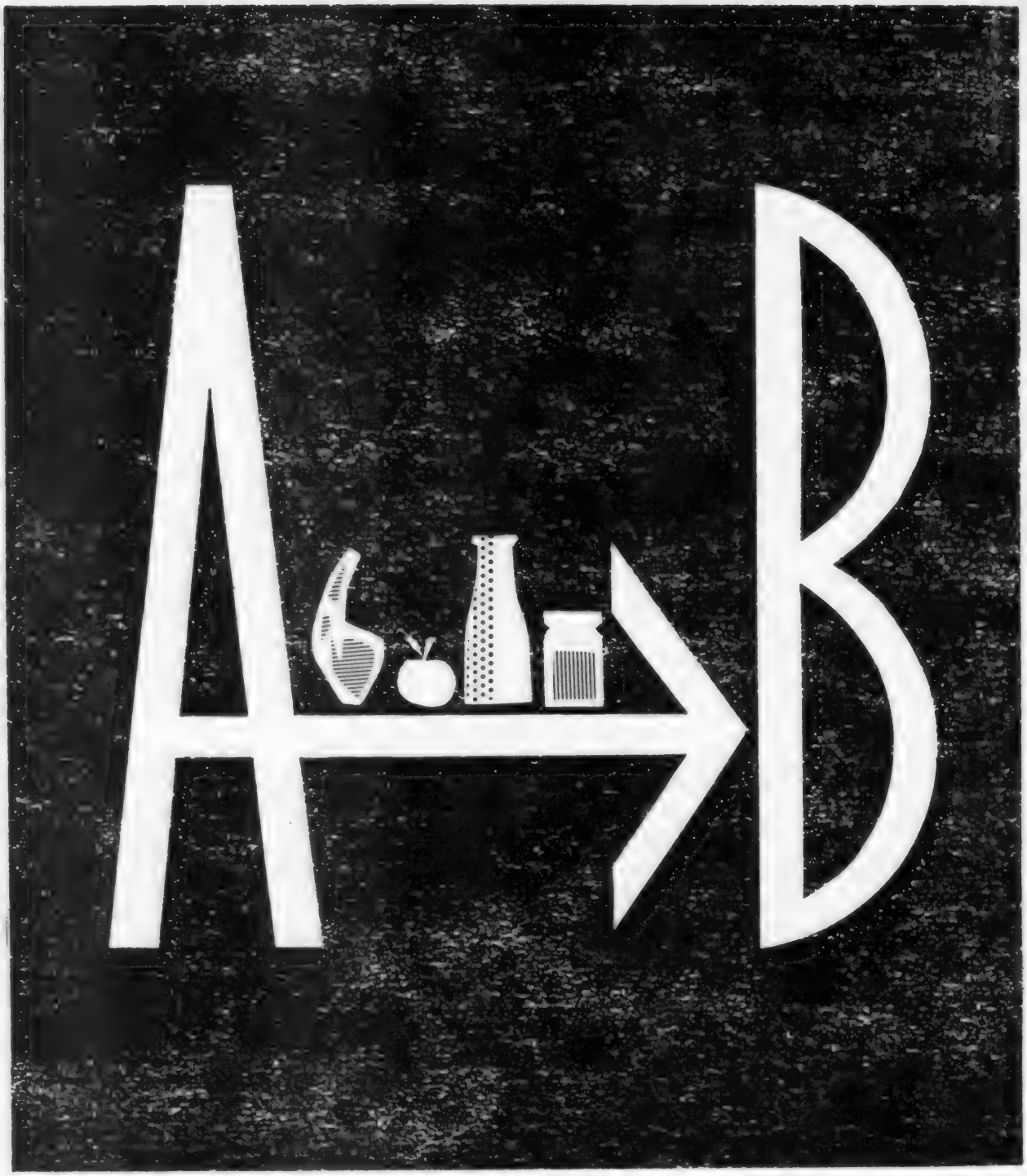

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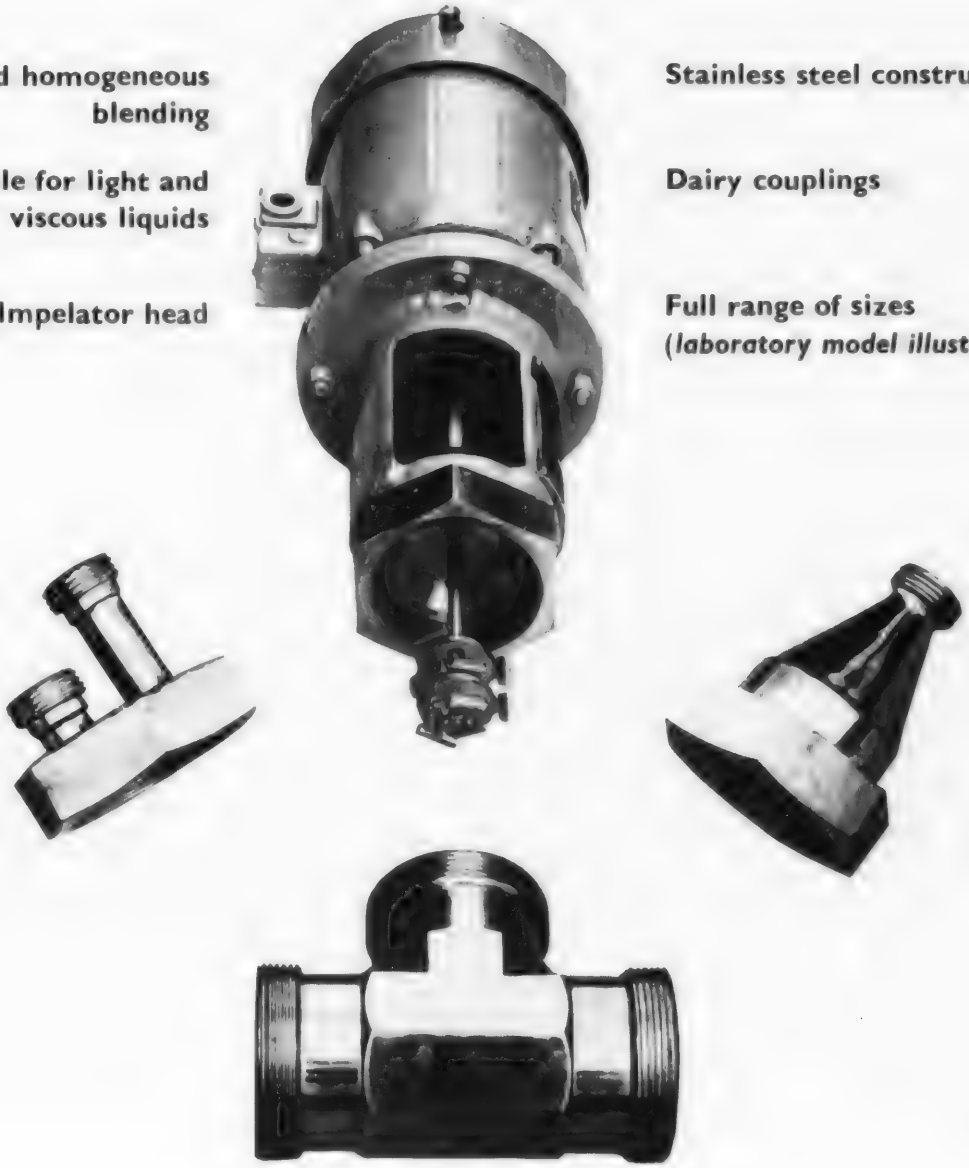

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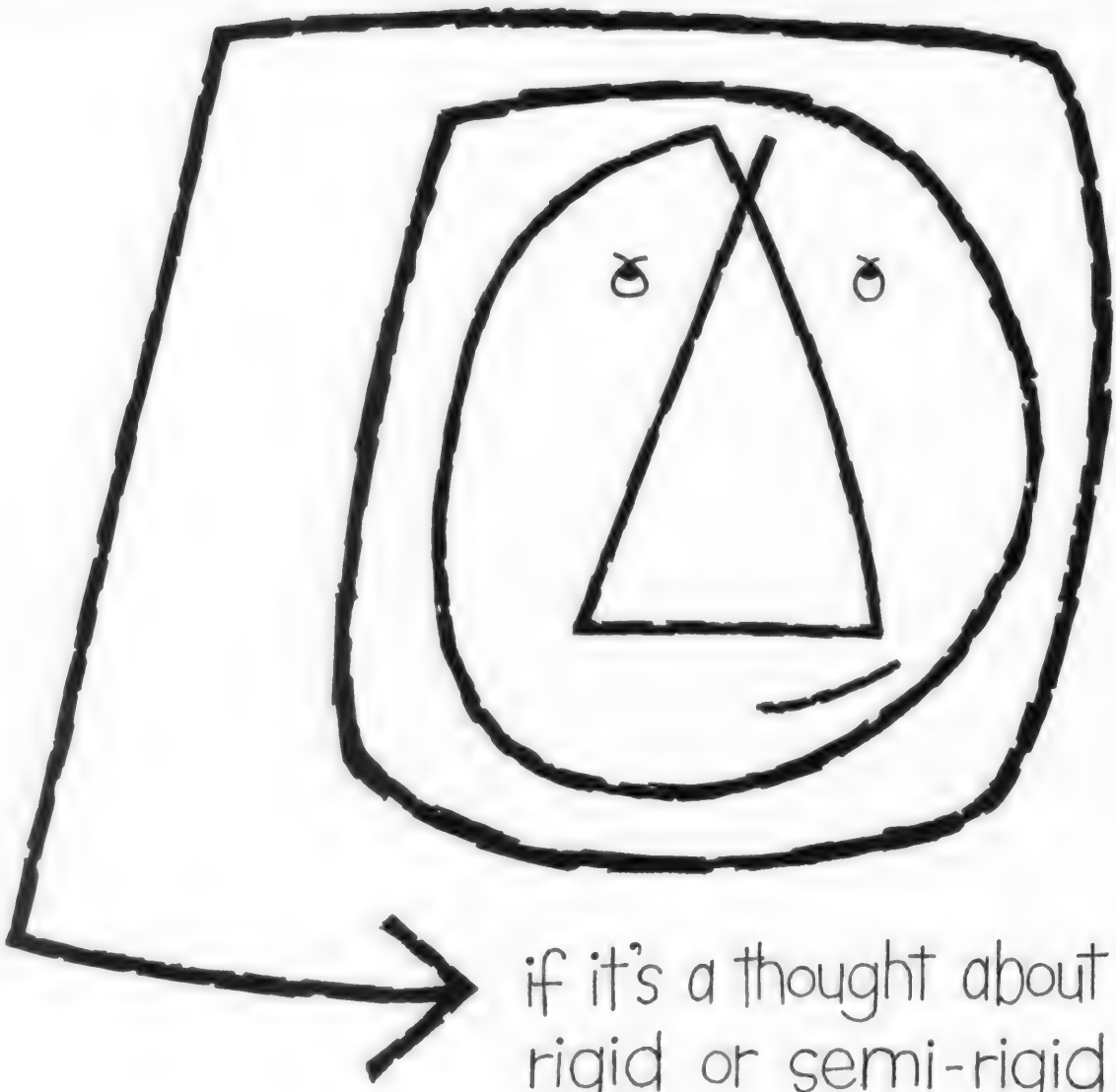

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T R F

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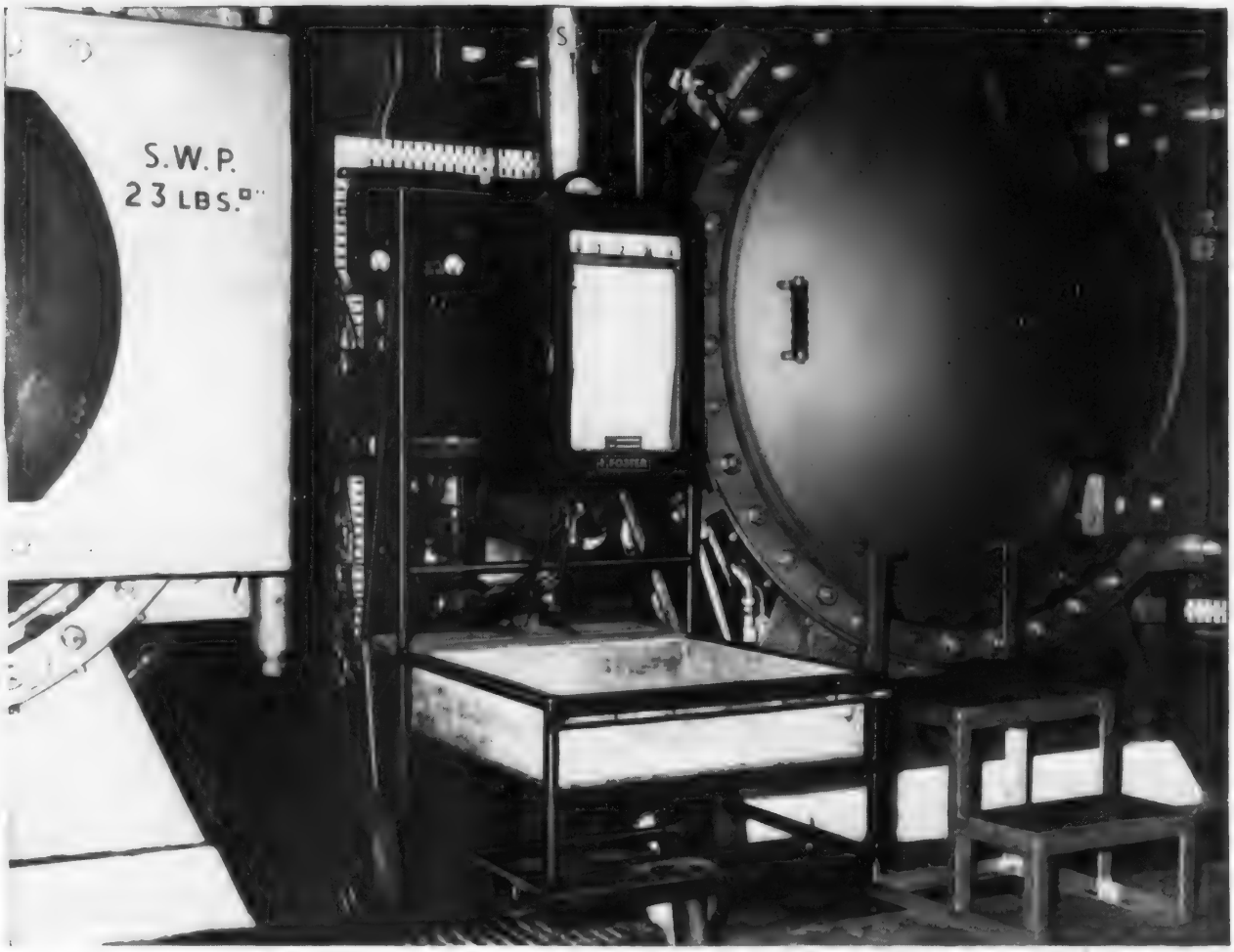
Sterilization of CANNED FOOD products

Proper sterilization of food in sealed containers is based on the principle that the product must be heated to such temperatures and to such times as is necessary to destroy the spores in the very centre of the product. We manufacture and supply a special range of temperature measuring equipment for this process.



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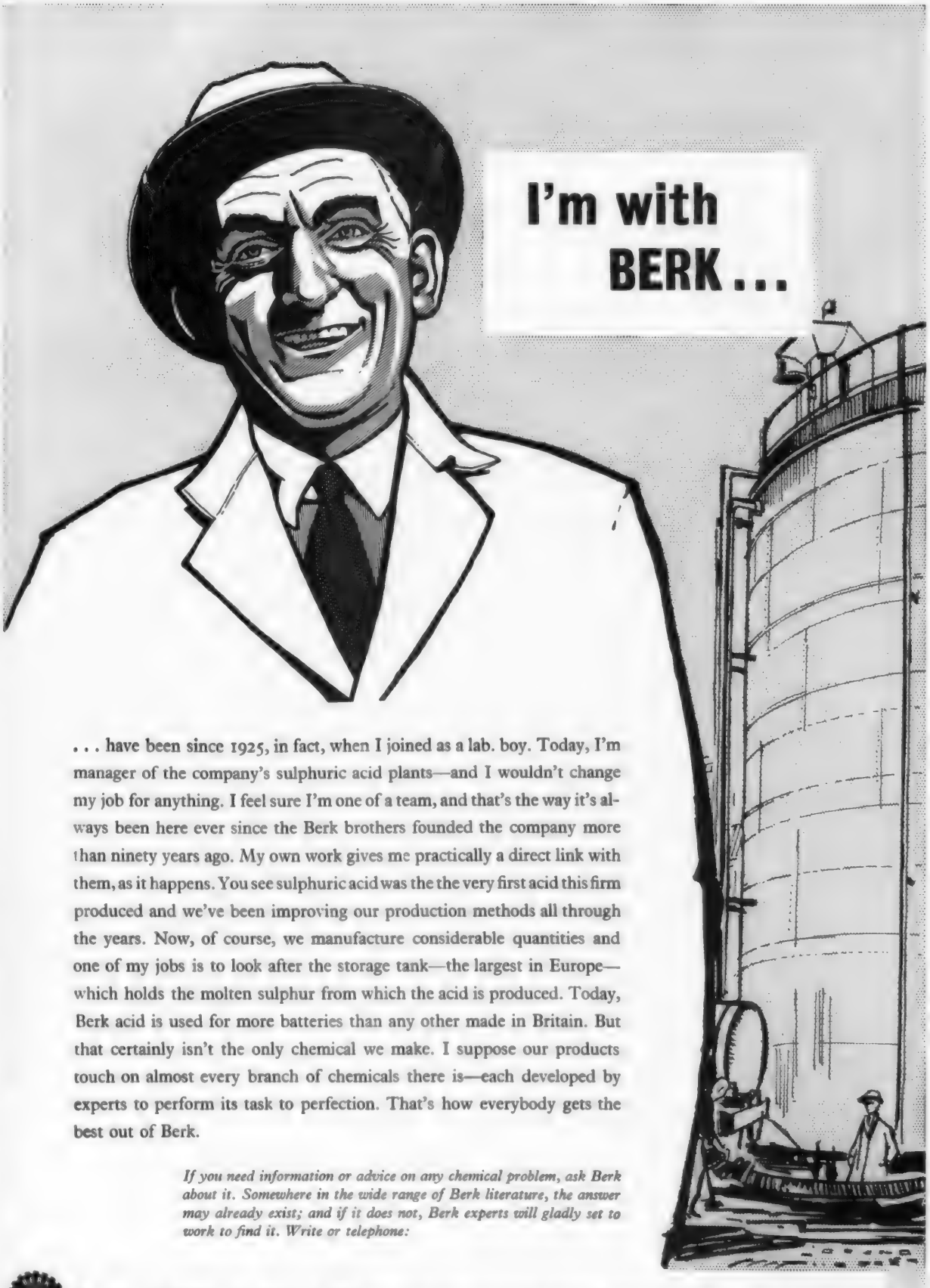

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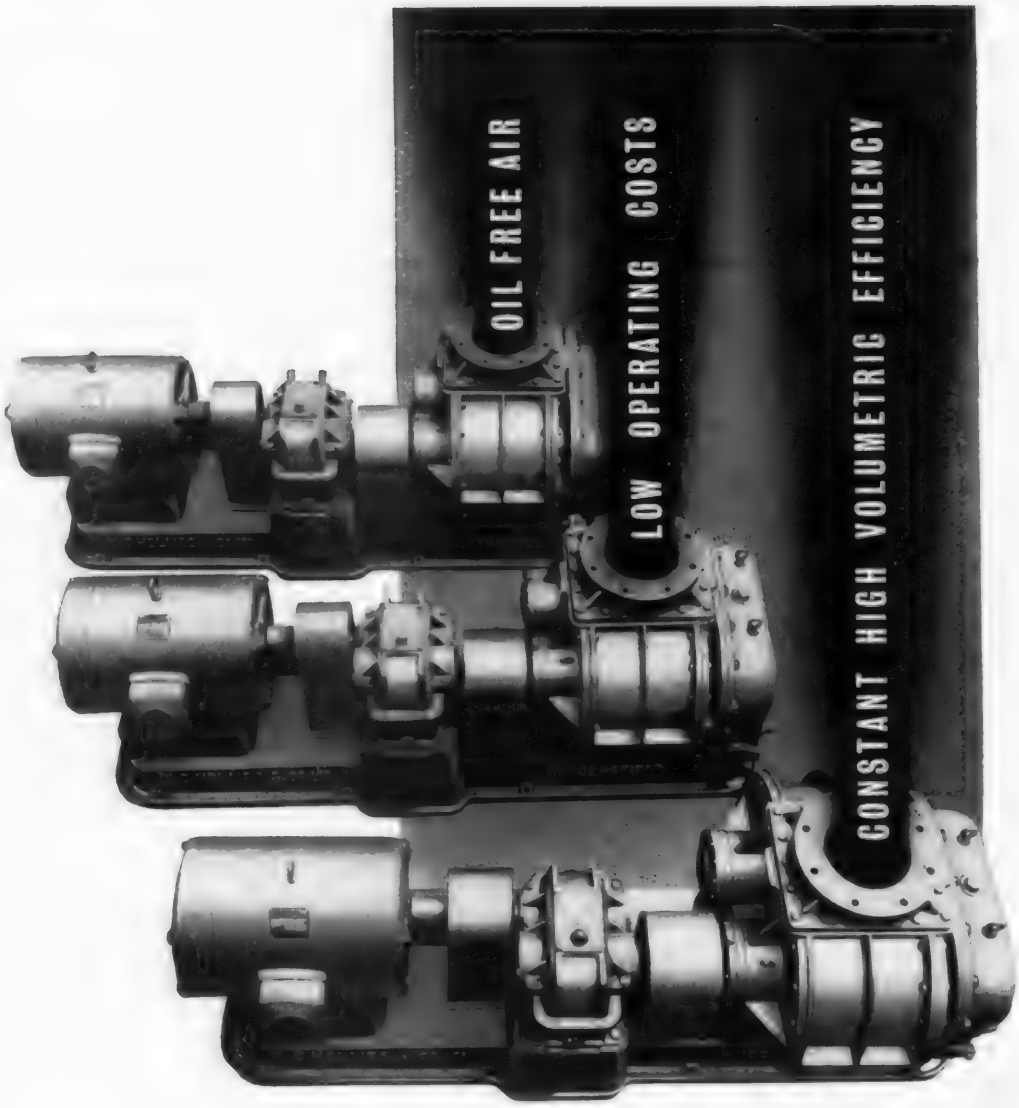

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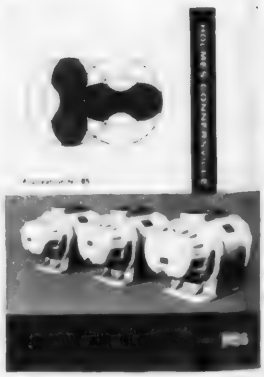

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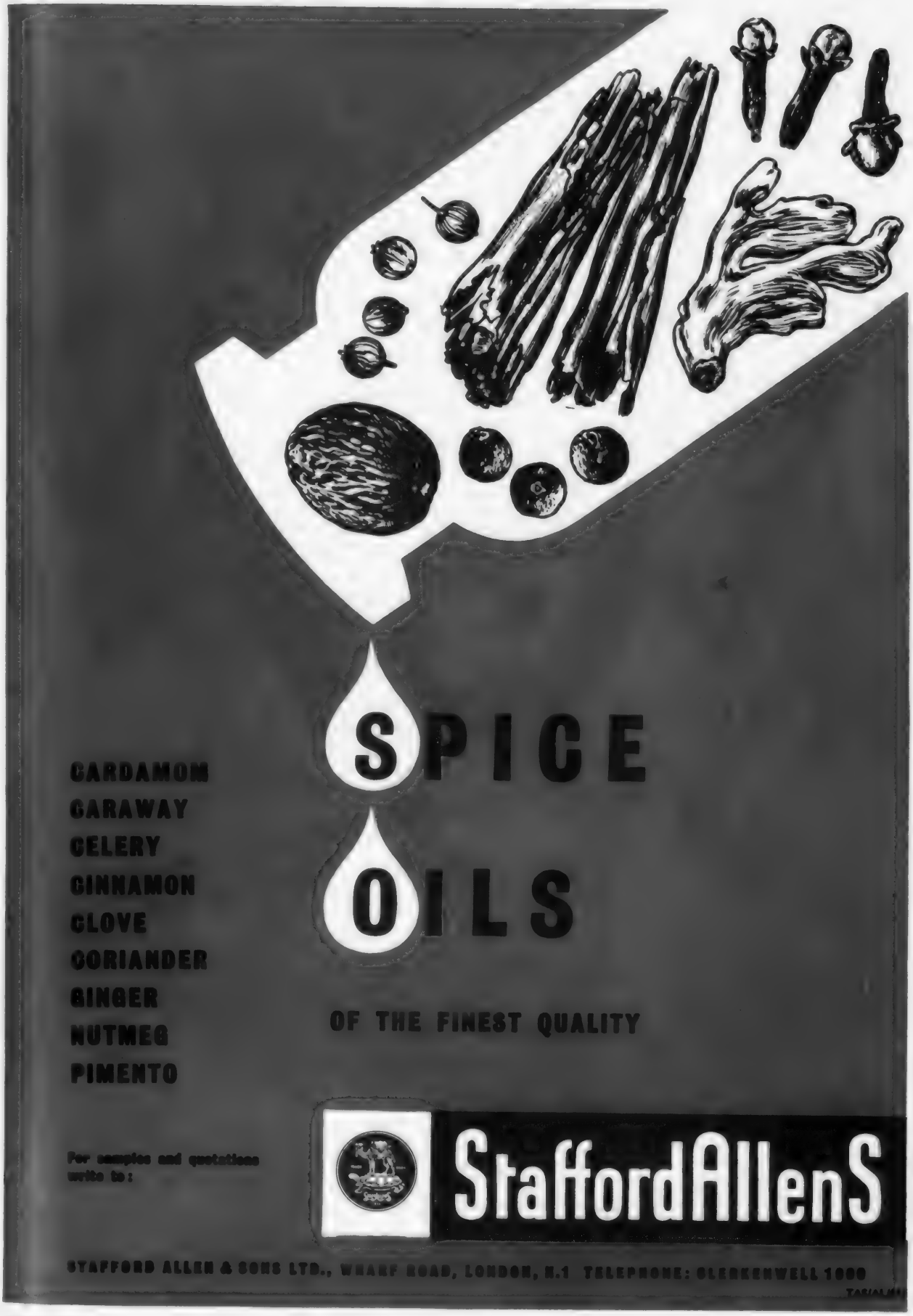
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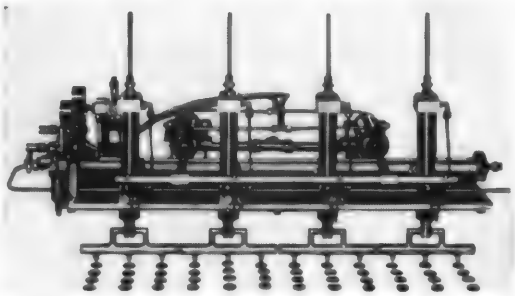

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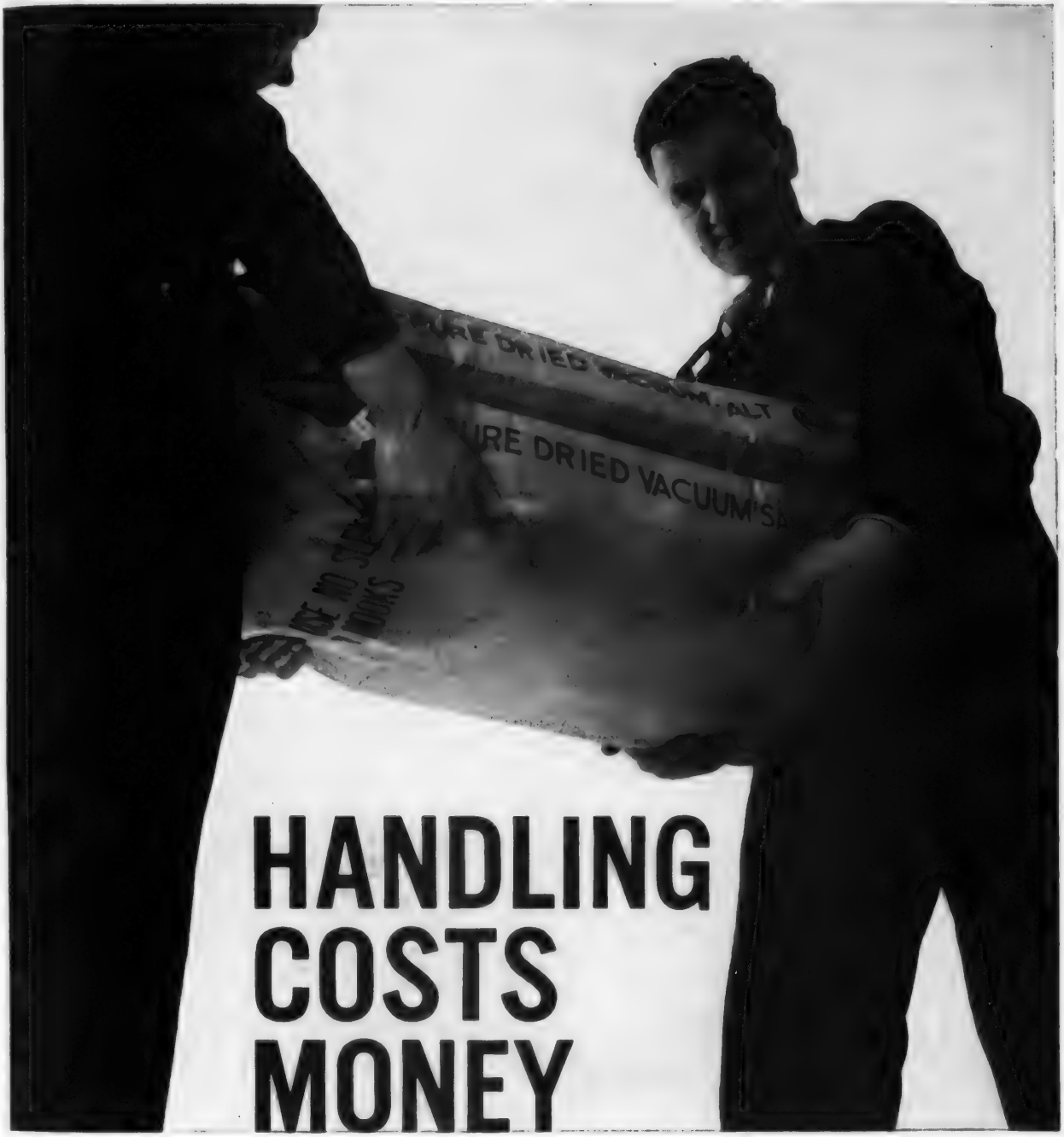

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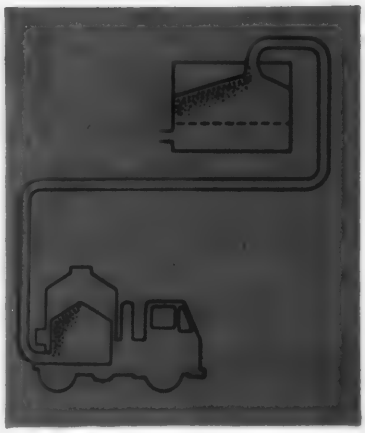

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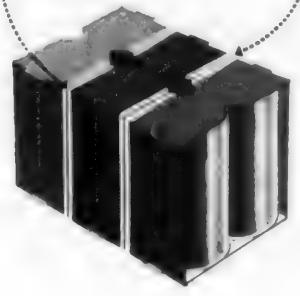

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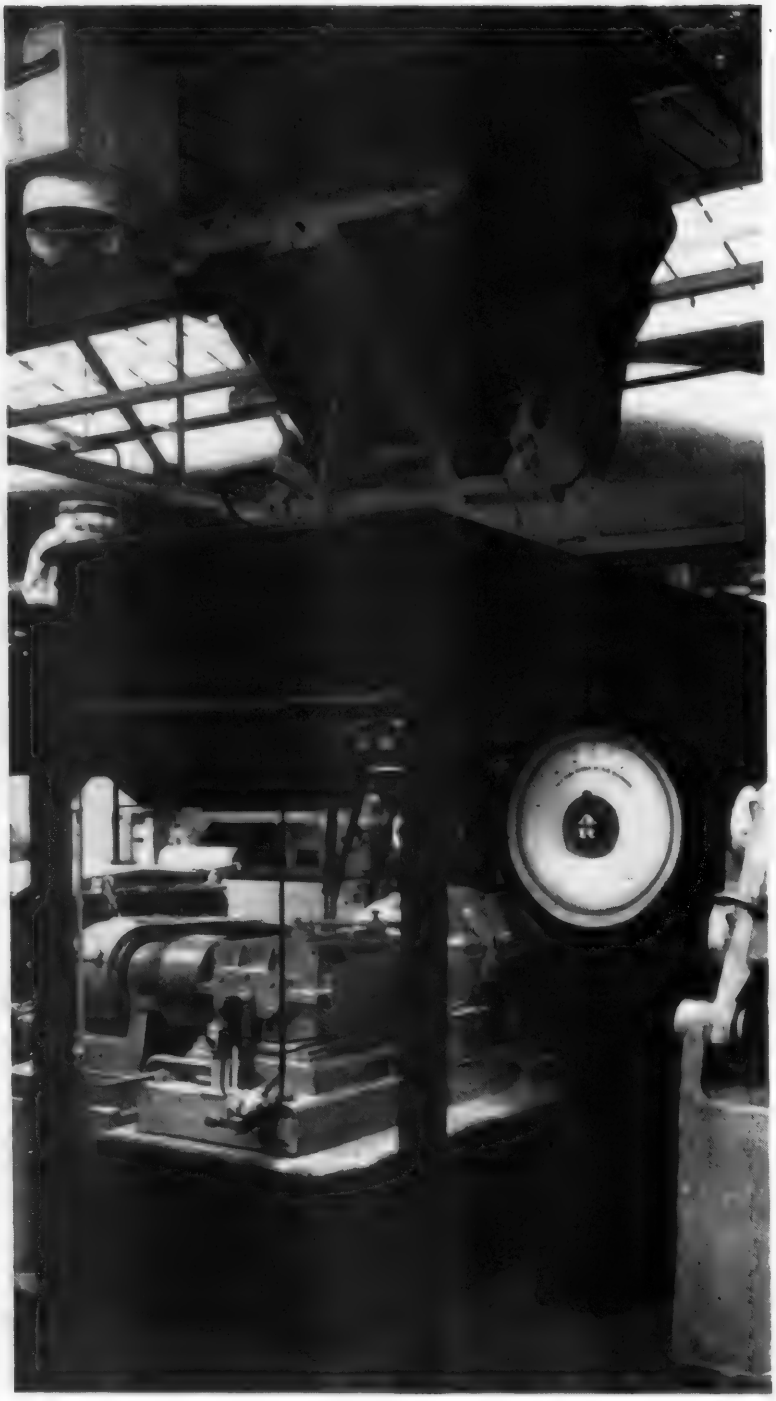

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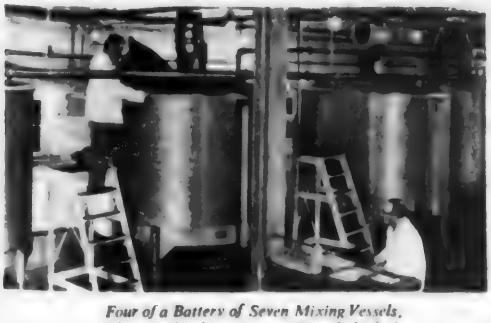

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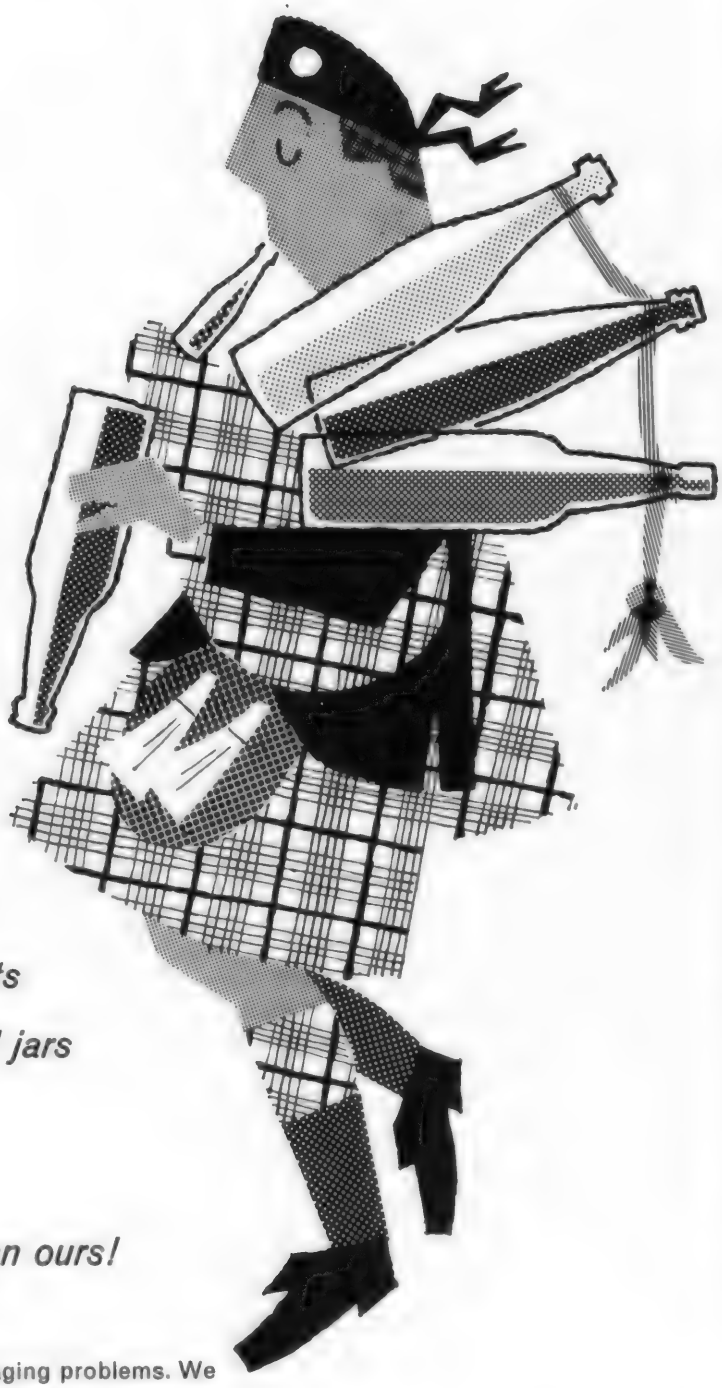

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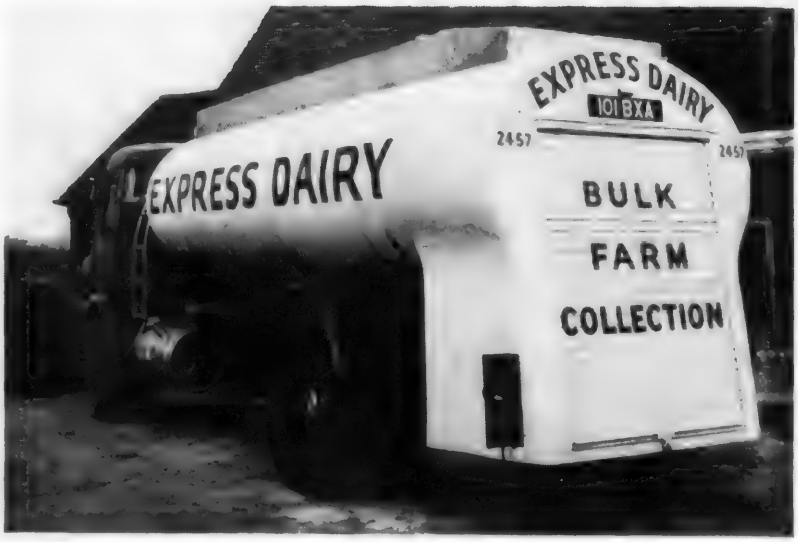

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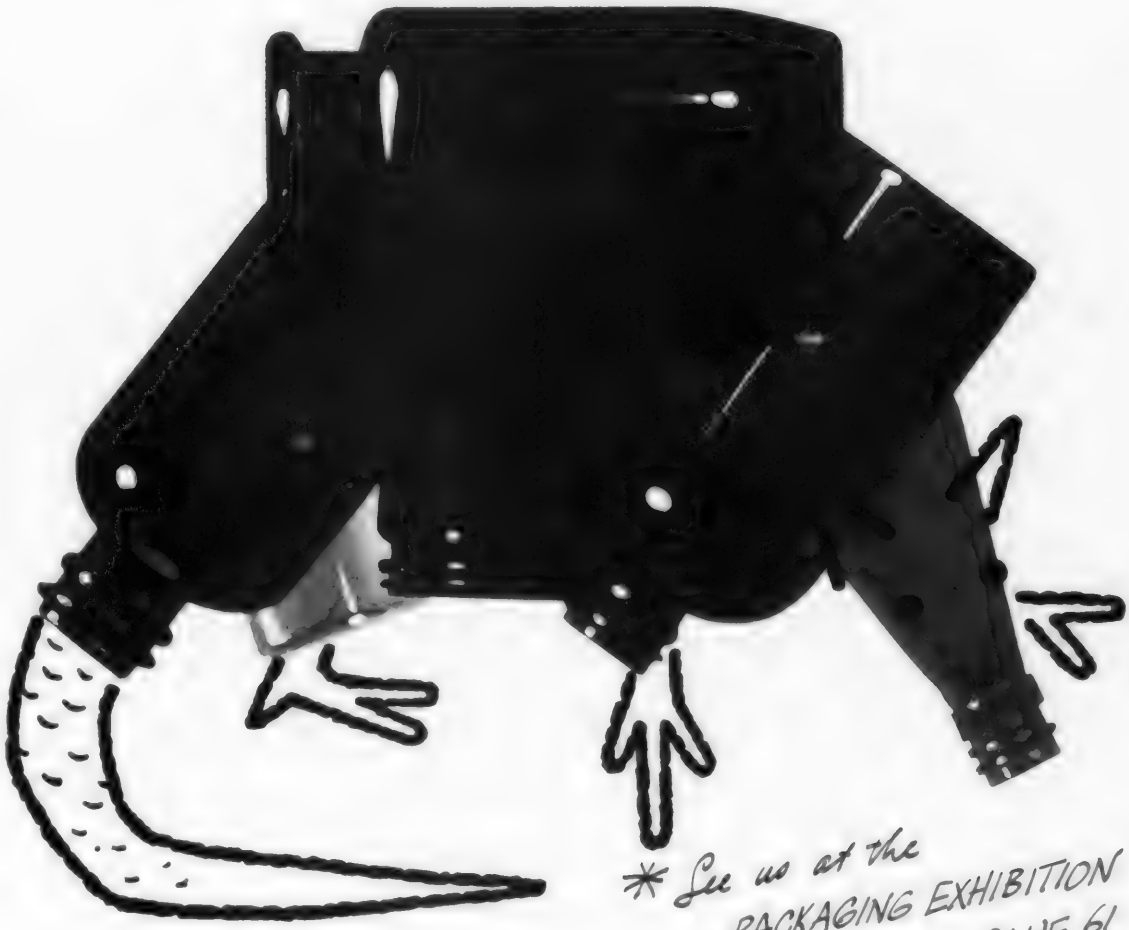

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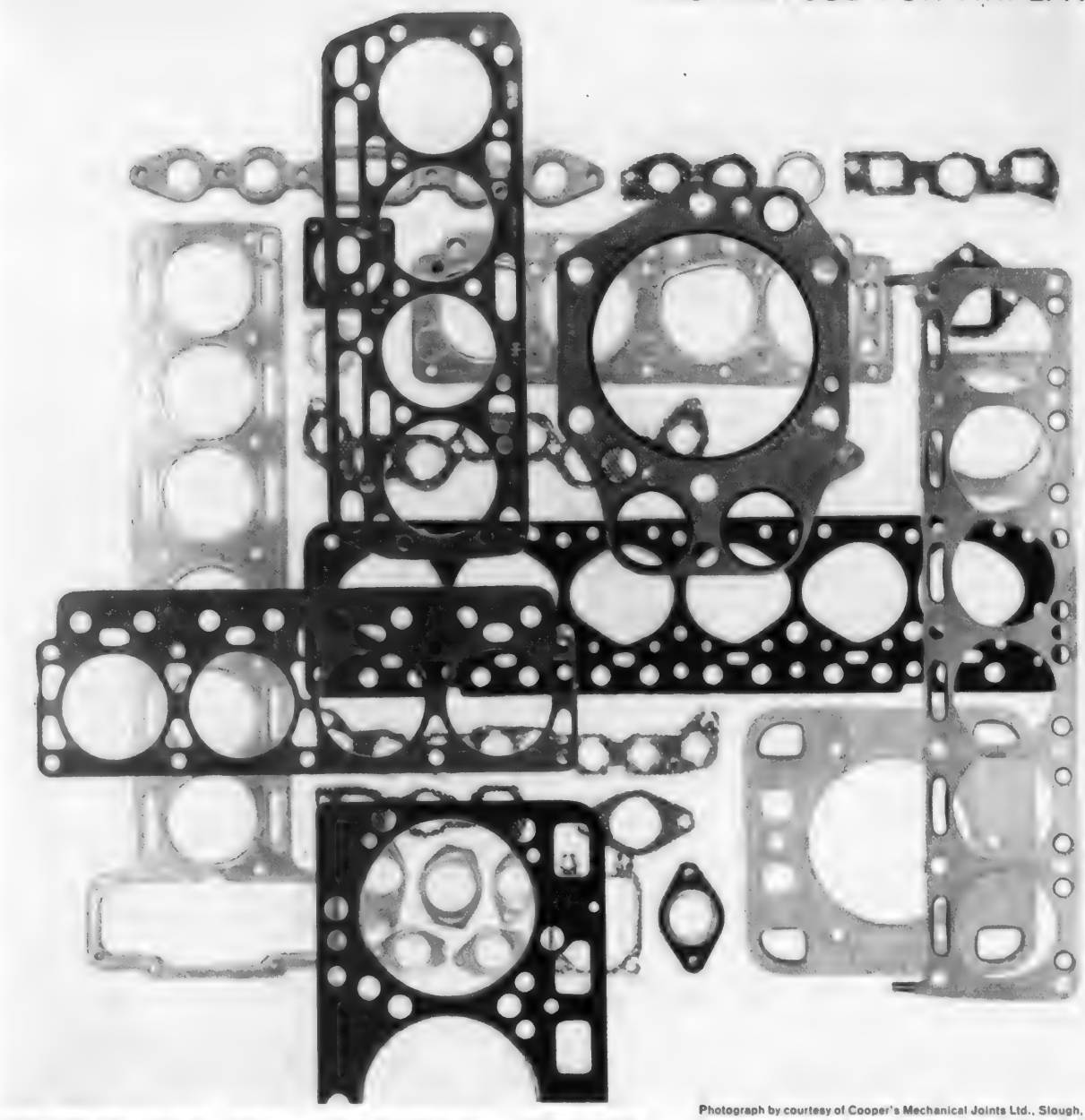

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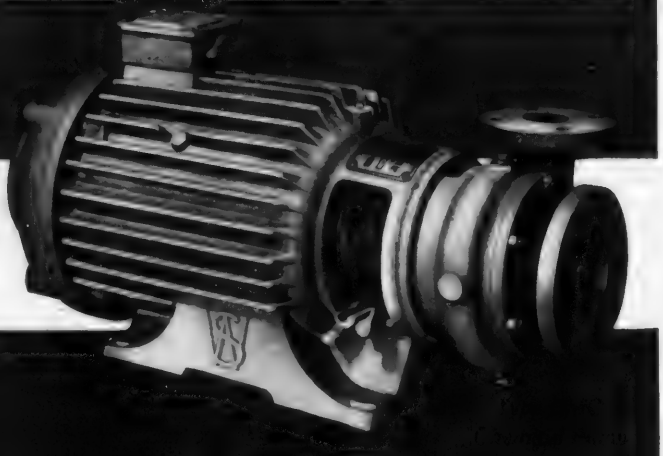

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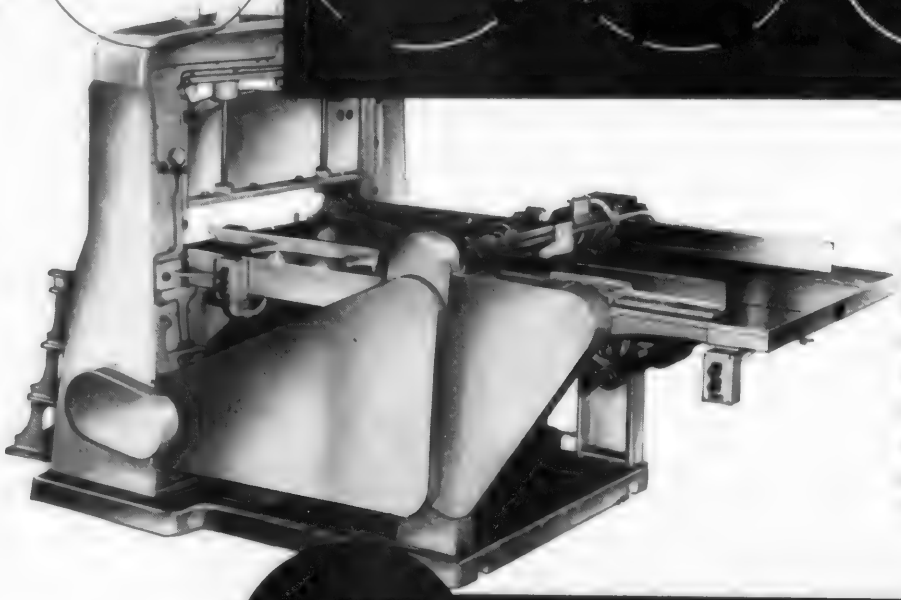
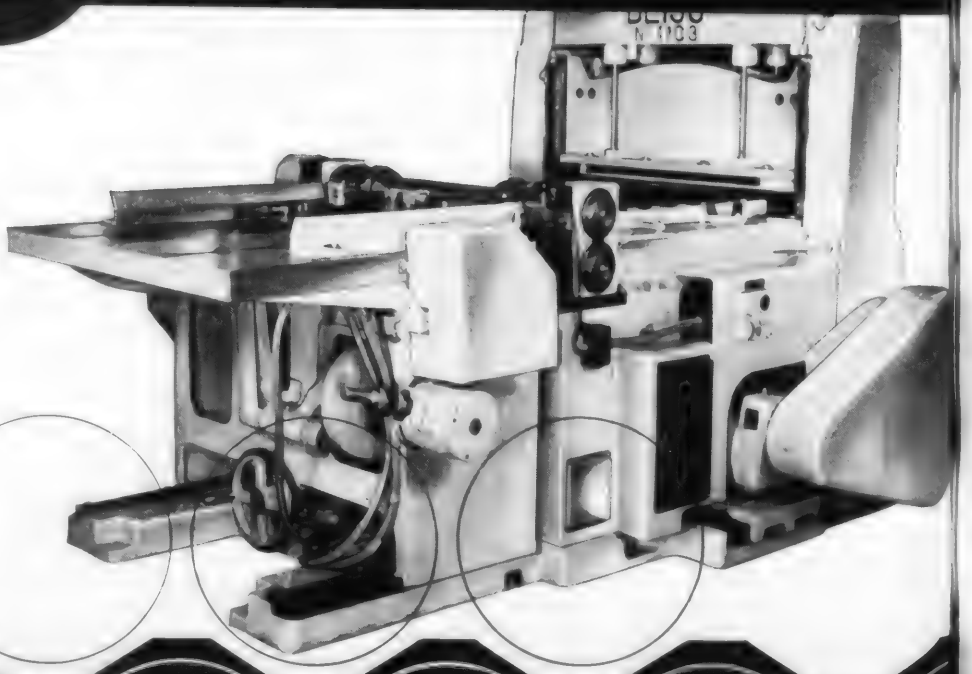


These machines blank, scroll and cut strips for single or multiple die production of can ends, bottle caps, jar and similar tops at speeds up to 120 strokes per minute, from plain or lithographed sheets. The use of scrolled strips yields significant savings in material—from 3% to 7%, depending on cut edge diameter.

No. 1100
No. 1103

for 36" square sheets at speeds up to 120 s.p.m.



The standard machine, Model No. 1100, is illustrated above. Model No. 1103, illustrated right, operates without an idle stroke between sheets, the first table retracting on gibbed ways to facilitate grinding of cutters.

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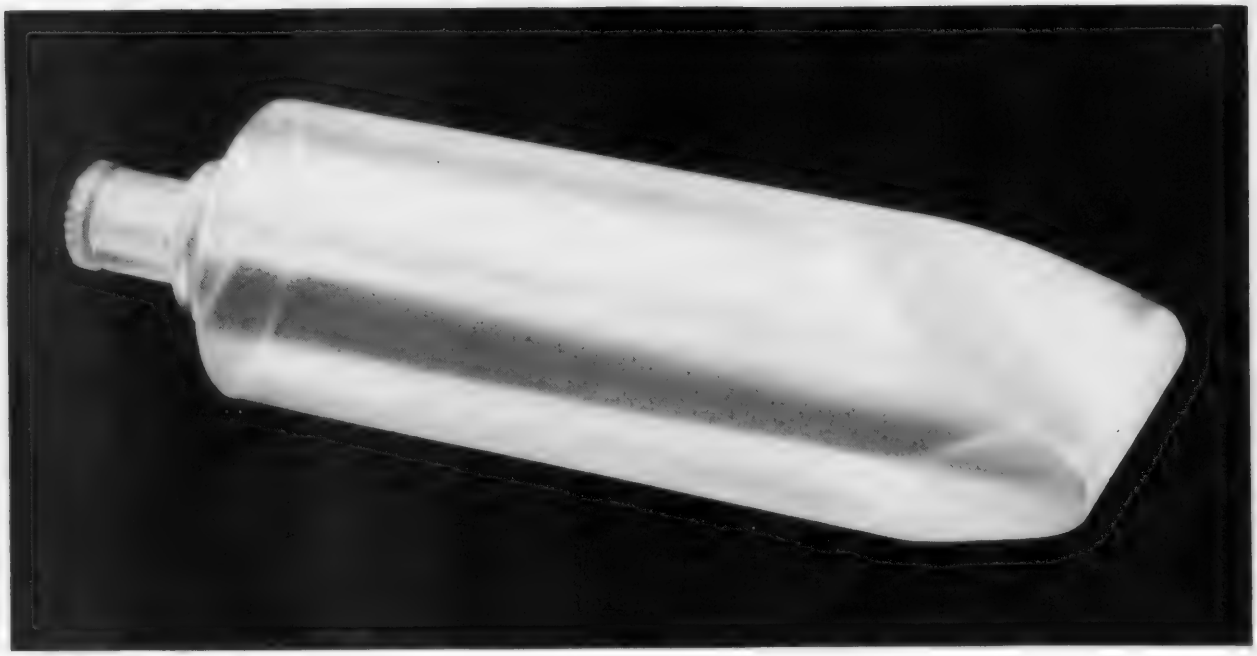

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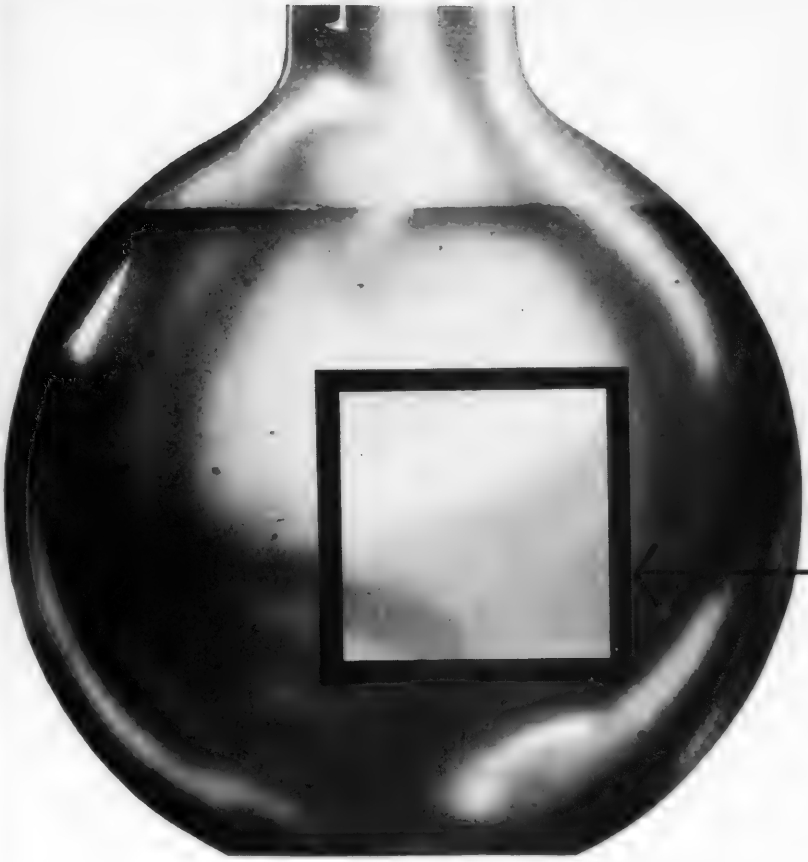

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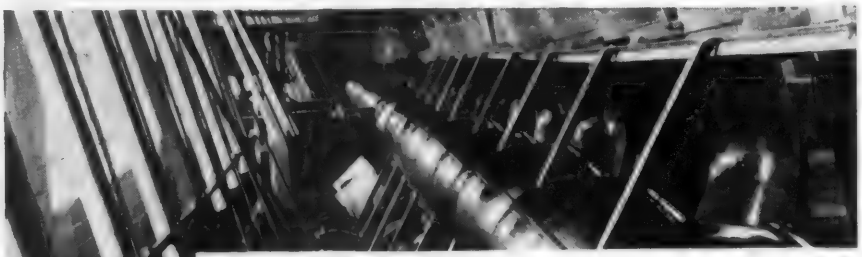

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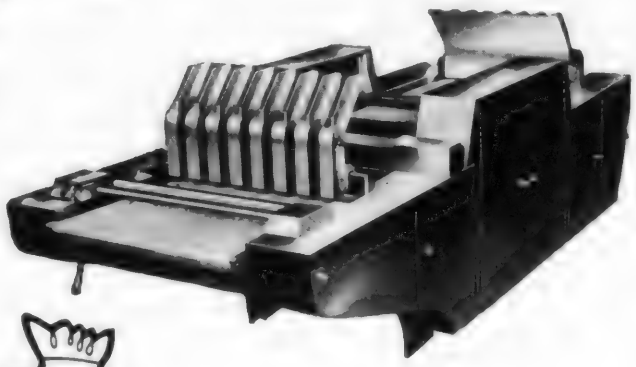

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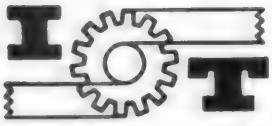

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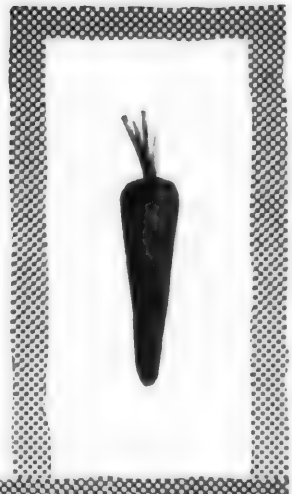

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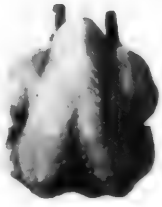

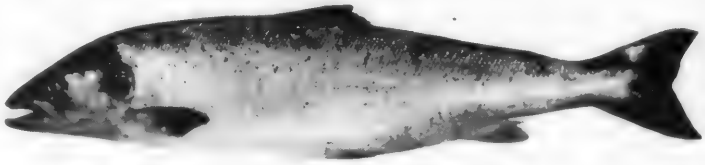

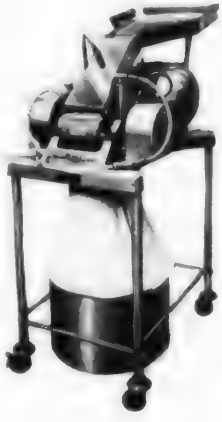

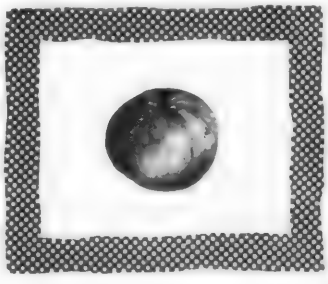

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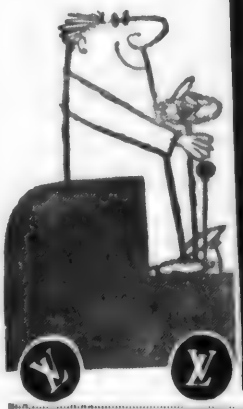

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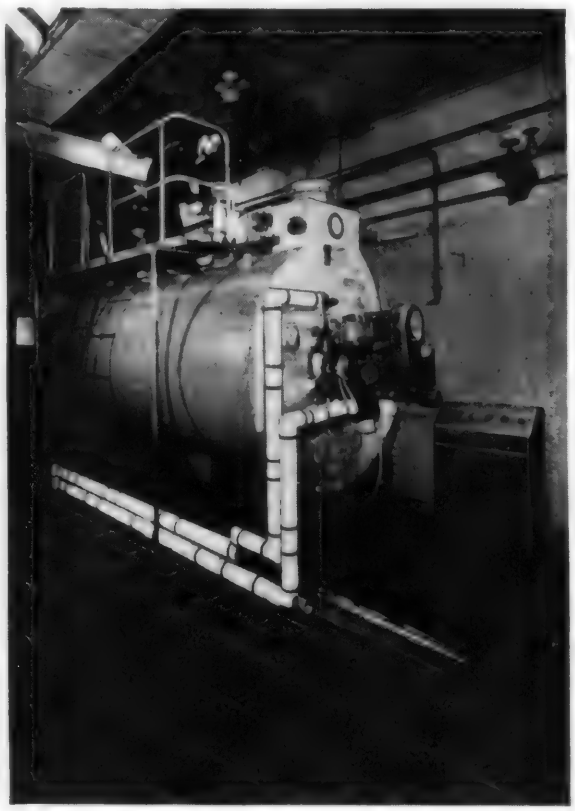

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FOOD Manufacture

Volume 36. Number 8 Editor: Anthony Woollen, B.Sc., A.R.C.S., A.R.I.C. August 1, 1961

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FOOD Manufacture

Vol. 36, No. 8 August 1, 1961

Should milk pasteurisation be made compulsory?

THE FACT that the whole of Britain is now an attested area seems to be causing a relaxation of vigilance on the part of local health authorities. The control of tuberculosis in milk has become less strict of late, and the proposal of the Ministry of Agriculture, Fisheries and Food to lengthen the interval between the compulsory tuberculin-testing of cattle without correspondingly placing increased emphasis on pasteurisation indicates a growing complacency, the danger of which is well brought out in the May issue of the Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service.

An article in that issue describes three serious breakdowns in the tuberculin-testing of milk scheme. In one, infection of 31 cattle in a herd of 128 in Yorkshire was traced to an old cow which had been slaughtered before the outbreak was discovered. Two cases of cervical adenitis occurred in schoolchildren as a result of drinking school milk from this herd; the milk was not at first suspected because the herd was T.T. certified.

The second breakdown occurred in Berwickshire in a herd of 118 animals. A tuberculous lymph gland in a slaughtered bullock from the herd led to the discovery that altogether 86 animals were infected, 43 of them having been sold before the outbreak was discovered.

The third breakdown, in Oxfordshire, was again discovered in the slaughterhouse; 35 animals were found to be infected. Twenty gallons of raw milk from the herd was retailed daily in the local village; subsequent testing revealed that 76 children, mainly under the age of 11 (47·5% of those tested), showed a positive reaction.

One of the points brought out in the report is the great rapidity of the spread of infection when the breakdowns occurred. In two of the three outbreaks, children contracted T.B. as a result. It therefore seems dangerously optimistic to assume that tuberculosis has been eradicated from British herds for all time, and the wisdom of reducing the frequency of sampling and testing is certainly questionable.

The article makes the further observation: "Though T.T. milk can generally be regarded as safe from the risk of causing tuberculosis, the same cannot be said about other diseases. T.T. herds are frequently infected with *Brucella abortus* and much of the milk-borne undulant fever in human beings, occurring at present, is due to drinking raw milk from these herds."

In view of the above we consider that there is a strong case for universal compulsory pasteurisation of milk.

Salmonellæ in feed is still a problem

ONE of the most important and difficult problems of public health is tracking down the origin of salmonella organisms which continue to be responsible for most of the food poisoning in England and Wales.

In 1957 Walker (see *The Lancet*, 1957, ii, 283) found that certain materials widely used in animal feeds, such as bone meal, dried blood and meat, were frequently contaminated with salmonellæ. As a result of the findings of Walker and others, a working party of the Public Health Laboratory Service was convened in 1957. It investigated 1,279 samples of home-produced and imported animal feeds and fertilisers. Samples of dust from factories and sacks were also examined. Their report (1959) showed that salmonellæ were present in raw and processed material, complete feeding meals and fertilisers. The report stated: "A high incidence was found in imported bones and bone products and in Angola fish meal. Altogether 88 serotypes were isolated, including 6 new types. The results of the examination of samples from the environment of the plant suggest that satisfactorily processed material may be contaminated with salmonellæ from factory dust and sacks."

A further report, on a fuller investigation by the working party and published in the April issue of the M. of H. and Public Health Laboratory's Monthly Bulletin, showed that 4,140 samples of raw ingredients and complete feeds from a large firm of animal feed manufacturers and millers were examined.

Salmonellæ were found in 9·0% of raw ingredients, 2·8% of finished meals and 0·27% of pelleted foods. Altogether 44 serotypes were isolated, including one new type.

In a second separate investigation of 627 samples of protein concentrated meal, a significant reduction in the salmonella isolation rate was found after the introduction of heat treatment of some animal protein ingredients.

A third and unrelated series of 493 samples of raw and finished feeding materials from twelve manufacturers was also examined. Salmonellæ were isolated from 13·1% of raw ingredients, 9·0% of finished meals and 1·7% of pelleted foods. The workers state—"The results reported in this paper confirm the findings of previous investigators that many of the raw ingredients used in the preparation of animal feeds contain salmonella organisms; it is, however, probable that these are usually present in relatively small numbers in the complete foods, particularly when they are pelleted. Further work is clearly required into the epidemiological significance of these findings and the importance of animal feeds as a source of salmonella organisms capable of causing food poisoning in man."

Hands across the North Sea

ANOTHER Food Group Summer Tour has come and gone, and those fortunate enough to take part, among them ourselves, came back with an abiding sense of gratitude to our Norwegian hosts for the kindness and hospitality which they extended to us, for the trouble they took to make the tour a success, and for answering our questions and showing us what we wanted to see with an uninhibited frankness which is not always met with in this country.

It was this spirit of friendship and a feeling of common interest with nothing to hide on either side which was the dominant impression of the tour, and which contributed more than anything else to the enjoyment of the week. An important factor in this was the fact that there was no language barrier; most of our Norwegian friends spoke perfect English and conversation, even in technical matters, could be carried on freely without the need for interpretation. Our Norwegian friends probably do not fully realise how helpful this was to those members of the party (all except two) who spoke no Norwegian, but it does illustrate how spoilt we British frequently are when we travel abroad. It is universally accepted that the Briton travelling abroad speaks no language but his own, and that foreigners, when they come to Britain, are expected to speak English.

The valuable contacts and enduring friendships made with people in our line of business overseas are what make these tours worthwhile, just as much as the actual visits to food factories abroad, which, when all is said and done, are usually much the same as factories here. Nevertheless, it is always instructive to see how the other fellow does things, and one remark made by one member of the party, a chief chemist of a well-known firm, made us think. He said that he made many visits to other factories in Britain during the course of his business, but being a chief chemist the people he visited always assumed he knew all about what went on in their factories and never bothered to show him round. Consequently he rarely saw inside factories other than his own. On a tour such as this, however, he was shown round many different kinds of factory and was able to ask elementary questions without the embarrassment of displaying his ignorance to people he knew.

Stavanger's food industry

THOSE who, thinking that all that went on in Stavanger was fish catching and canning, wondered why the Food Group chose that town for their tour this year, were in for a surprise. Stavanger is in fact the centre of the largest food producing and processing area in Norway, and there are many different kinds of food processing there besides fish. Among the establishments visited by the Food Group were a dairy, with a very up-to-date school attached for training women dairy operatives, a soya-bean oil extraction plant and refinery, a flour mill, a meat processing plant, an egg packing station and poultry processing plant (the first in Norway to be run on "broiler" lines), a margarine factory, a bread and flour confectionery plant, as well as Stavanger's largest fish cannery.

The well-known Research Institute of the Norwegian Canning Industry was visited, with its associated Quality Control Institute and Canning School. The party also called on the Norwegian Fisheries Research Institute in Bergen, which is a Government laboratory for research into fish and fish products of all kinds except canned goods; these are dealt with by the laboratory in Stavanger.

A joint meeting was held with the Rogaland Section of the Norwegian Chemical Society, at which Mr. T. McLachlan, Chairman of the Food Group, read a paper on the development of public analytical work in Britain and some aspects of Norwegian foods which affect the British public analyst. The discussion which followed was stated by those who should know to be one of the liveliest of any on a Summer Tour.

Those manufacturers who are still undecided about the wisdom of sending members of their staff on the Summer Tour should be able to infer from the fore-

going that the week is far from being an official jollification, the entertainment value of which outweighs the didactic. The tour is regularly supported by a number of large manufacturers, but their number could be greatly increased. Besides the obvious advantages accruing to participants of having their outlook broadened and their wits stimulated, it is whispered that more than one member of this year's tour even transacted some profitable business.

Good and bad in Norway

ONE of the strongest impressions gained from the visit to Norway was the high degree of small-scale mechanisation. For a small country (its population is 3½ million, with only two towns of over 100,000 inhabitants) it is very highly organised, and the standard of living of its people is high. Cheap electric power, of course, is the key to this, and the large electric boilers in some of the factories made us green with envy.

Another impression was the degree of socialisation which exists in the food industry over there. Co-operative processing and marketing is developed to a much higher degree than in this country. The Norwegians' attitude to research is also different from ours. In this country the research associations go down on their knees and beg funds from industry, the members of which are free to contribute or not as they think fit. In Norway there is no nonsense; in the fish canning industry, for example, a levy is compulsorily imposed on every canner, and the money goes to finance research for the benefit of all.

The Norwegians cannot afford the luxury of dilettantism in food processing, for much of their products are for export to highly competitive markets such as Britain and U.S.A. Home consumption being very low because of the small population, there is not the same competition on the home market as there is in this country or in the U.S.A. to keep manufacturers on their toes. The Norwegians are acutely quality-conscious, and realise that one black sheep may spoil the market for a whole industry. They therefore take no chances.

If there is one thing about the Norwegian way of running factories which does not come up to British standards, it is the matter of safety, and we are sure our Norwegian friends will not take our remarks amiss, because these remarks do not concern the efficiency of their processing methods or the quality of their products. In some factories the unguarded belts, naked machinery and unfenced walkways and stairways would not have passed the factory inspector in this country. We do not know how the industrial accident rate in Norway compares with our own; perhaps the Norwegian worker is more careful than the British and needs less coddling, but we do not know. In one factory we visited there was a raised edge at the top of each flight of a high spiral staircase; in another, a worker ascending a ladder had to twist his body to avoid a naked driving pulley rotating at high speed; in another, dangerous machinery was unguarded. These instances could be multiplied. If we mention these things it is because in praising the good we cannot gloss over the bad, and our Norwegian friends would not want us to. It is a tribute to them that the bad we saw was so little and the good so much.

A wicked waste of money

So President Kennedy intends to spend £17,000 million on putting a man on the moon. Presumably Mr. Khruschev's intentions involve much the same amount of money. Thirty-four thousand million pounds—enough to give every man, woman and child on this planet a good square meal every day for a month, and a snack as well. If by the time a man has reached the moon two-thirds of the world's people are still hungry, the money will have been wickedly wasted.

"I'm all right, Jack!"

SHOCKING and blunt figures about world hunger, poverty and ignorance are revealed at the "World in Want" exhibition now running in London. In Nepal 95% and in India 39% of the population are illiterate. The key to winning the battle against ignorance, hunger and disease is education, yet for half the world's children there are no schools. In many areas only one child of school age in ten goes to school.

Of every thousand babies born in Brazil, 170 die in their first year. The life expectancy in India is 42 years, in Guinea it is 30. In the world there are 10 million lepers, only 1½ million of whom are receiving any treatment. Every year 150 million people succumb to malaria, which kills many and permanently weakens a lot more so that they cannot work.

The reason for all this misery is simple—people in the underdeveloped countries have not yet learned to produce enough food for themselves. Because the countries are so poor they cannot establish the necessary schools and research centres nor pay for teachers and technicians to staff them. Because there are no schools or teachers the people remain sunk in ignorance and poverty. A vicious circle.

We think we have published enough information in past issues of this journal to convince readers that enough food can be produced to support the world's population. By spreading knowledge of

modern techniques among underdeveloped peoples the existing land and waters could be made to produce much more, and more land could be utilised.

There can never be peace in the world while one-third of its inhabitants have more than they need and the remaining two-thirds have not enough. One-third of the world spends its time in pursuit of a higher and higher standard of living. "I'm all right, Jack," it says in effect. We as individuals and collectively as nations might eventually be a lot more "all right" if there were a greater spirit of sacrifice, and if more money were given to those organisations working to improve the lot of the hungry two-thirds.

The trend towards cans

WE recently saw 12-oz. cans of carbonated soft drinks coming off Beecham's new production line at Coleford (described on p. 324 of this issue) at the impressive rate of more than 300 a minute. In the first ten weeks since it went on stream in April this production line produced ten million cans. Assuming this rate keeps up until the end of September, this means 25 million cans for one season's output from one plant. Nine other manufacturers are now turning out canned soft drinks for all they are worth; would 100 million cans be a wild guess for this year's production of canned soft drinks in this country?

Whatever the actual figure may be, it will startlingly exceed last year's total output by all manufacturers of 15 million cans. We learnt during our visit to Coleford that Beecham's estimated production requirements, based on a pilot market test last year, were cut by half because they seemed too fantastic; Beecham's now find their first estimate was quite realistic, and can hardly supply the demand.

American experience of sparkling soft drinks in cans has been that consumer acceptance has increased rapidly. In 1959 can sales jumped 34% while the rest of the soft drink industry increased by only 9%, and in 1960 canned soft drinks increased their sales by 46%. This year it is estimated that 1,200 million cans of soft drink will be sold in the U.S.A.

The can interests say that as a result of larger vehicle loads and quicker turn-round, distribution costs as a result of using cans can be cut by as much as 60%. This means a great deal to an industry whose major costs lie in distribution. Against this must be set the fact that expendable cans cost more than returnable bottles, and if the price of soft drink per fluid oz. is to be the same, the retailer must accept a lower profit margin on the cans. This he may be prepared to do if he has difficulty in handling returnable bottles and if his overall volume of can sales is increased.

Last year, 75% of the output of over 415 million gallons of ready-to-drink soft drinks, valued at over £100 million, the best ever, was sold in 146,000 grocers' shops, including 7,500 self-service stores handling a much higher proportion of overall trade than their number suggests. This market is virtually untapped by a non-returnable container.

Bottles increasing too

NATURALLY the glass interests are not taking the threat from cans lying down, and a comparison between bottles and jars made today and those made pre-war show the great strides made both in the technical control of glass manufacture and in the processes by which bottles and jars are made. Today's glass containers are not only stronger, lighter and much more precisely made but more attention is being given to their designs and shapes to make them more attractive.

Glass has several intrinsic properties possessed by no other material which assure it an important place in the packaging field in the face of all competition. Among these its transparency, chemical inertness and ease of sterilisation are probably the most important, and it is interesting to note that a recent market survey whose purpose was to analyse consumer attitudes towards different types of containers brought out the importance to the consumer of the fact that glass protects the product better than any other packaging material.

We were speaking recently to the chief chemist of a well-known firm of brewers. He claimed that he could unfailingly detect canned beer from bottled, and suggested that certain subtle flavour constituents were adsorbed by the lacquer of the cans. Soft drinkers are probably less critical than beer drinkers, and we have yet to meet someone with such a sensitive palate that he could detect a deficiency in the flavour of canned soft drinks.

Tailpiece

TO END this dissertation on flavour detection, we recount the story of the wine taster who wagered he could name the brand and vintage of any wine blindfold. His challenge was accepted, and he was led blindfold before a line-up of 40 glasses. Thirty-nine of the glasses contained various wines, but the last glass of all contained pure, genuine water. The wine taster went down the line of glasses, tasting each and correctly identifying it, until he came to the glass of water. He sipped, paled, then said: "Gentlemen, I have lost my bet, I do not know what this is. But of one thing I am certain, this will never be popular."

How TRUFOOD make Infant Foods

"Humanised" milk powder by spray drying

Trufood make infant food by recombining the constituents of cow's milk—skim milk, cream and whey—to give a product of similar composition to human milk. The product—"Humanised Trufood"—is then spray dried. This article describes the process and the plant at Wrenbury, Cheshire, where a new spray dryer of the latest design has recently been installed.

TRUFOOD'S factory at Wrenbury, in Cheshire, was built by American interests and was opened in 1909 for the purpose of producing commercial spray-dried milk. It was one of the earliest examples of a commercial spray-drying plant. It also produced a commercial dried-egg product known as "Truegg," some of this being taken by Captain Scott on his 1911/12 Antarctic expedition. It is interesting to record that a sample of the same batch of "Truegg" that was taken on this expedition was kept by the firm until a few months ago.

The firm became part of the Unilever organisation in 1921 as a result of its association with Planters Foods, Ltd., a member of the Unilever Group, to whom the company supplied dried milk for use in margarine manufacture at Bromborough. Dried milk is now no longer supplied for this purpose. Trufood, Ltd., left the Unilever Group and was acquired by Cow and Gate, Ltd., in 1955, becoming a member of Unigate, Ltd., when Cow and Gate merged with United Dairies.

(*Above*): **This picture, taken by the Editor through an inspection port in the Blaw Knox spray dryer, shows a spray of concentrated milk emerging at high velocity from each of two injection nozzles and being atomised. The moisture is evaporated by the warm air which circulates in the drying chamber, and the milk powder falls to the bottom of the chamber. The two coiled rods are temperature measuring probes.**

The company began selling spray-dried milk powder as a baby food in 1922, but it was quickly realised that cow's milk was not an ideal substitute for human milk, and in 1923, a milk powder of modified composition was put on the market under the name *Humanised Trufood*. As its name implies, this is a milk product whose constituents have been altered to approximate very closely to those of human milk.

The table overleaf gives the composition of human and bovine milk for comparison.

It will be seen that the principal differences between human and bovine milk are in the contents of protein and carbohydrate, cow's milk containing three times as

much protein but only three-quarters as much carbohydrate (lactose). The protein difference lies in the ratio of casein to soluble protein which has an important influence on digestibility. The table shows that there are also differences in vitamin content, human milk containing much more Vitamin A, B_2 (nicotinic acid) and C.

The basis of the manufacture of *Humanised Trufood* is the breaking down of pasteurised whole milk into skim milk, cream and whey, and the recombination of these in such proportions that the character of the protein is changed to that of human milk, while the fat and lactose contents are adjusted to give a milk formula based on that of human milk.

The low temperature spray-drying process ensures that no fat separation takes place when the reconstituted foods are allowed to stand. In addition there is no cooked flavour.

Table I. Composition of Human and Bovine Milk*

	Approx. % content (average)	
	Human	Bovine
Fat	3·6	3·75
Protein	1·2	3·4
Casein	0·8	3·0
Albumin and globulin	0·4	0·4
Lactose	6·5	4·8
Salts	0·2	0·7
Calcium	0·036	0·12
Sodium	0·02	0·04
Potassium	0·05	0·14
Phosphorus	0·018	0·095
Chloride	0·04	0·08
Citric acid	0·1	0·2
Trace elements		
Iron	0·12 mg.	0·08 mg.
Copper	0·06 mg.	0·016 mg.
Manganese	—	5
Iodine	4·5	5
Vitamins		
A	200 to 500 I.U.	28 to 280 I.U.
B	1 to 4 I.U.	15 to 25 I.U.
B_2 Riboflavin	0·04 m.g.	0·1 to 0·3 mg.
B_2 Nicotinic acid	0·18 mg.	0·085 mg.
C	4 mg.	2 mg.
D	0·4 to 10 I.U.	0·3 to 5 I.U.

* From *Dictionary of Dairying* (J. G. Davis) (Leonard Hill, Ltd.)

Other products

Besides *Humanised Trufood* the company manufacture a number of other spray-dried milk products, some of which are specially formulated to meet certain medical needs. Among these are *Prosol*, a high protein milk powder prepared by spray-drying a mixture of dissolved precipitated milk protein and skim milk after addition of vitamins; *Edosol*, a low sodium milk powder; *Locasol*, a low-calcium product free from Vitamin D intended for use in treating infants and children who show a raised serum calcium; *Galactomin*, a low lactose product designed for use as a substitute for milk in cases of congenital galactosæmia; and *Minafen*, a food with a low phenylalanine content for the dietary treatment of phenylketonuria.

Other *Trufood* products are *Trufood Half Cream*, with a low fat content, valuable in cases of prematurity or fat intolerance; *Trufood Full Cream*, consisting of spray-dried cow's milk fortified with Vitamins A and D and ferric ammonium citrate; *Follow-on-Trufood*, a weaning food containing milk, whey, cream, malt, sucrose, glucose, yeast extract, hydrolysed protein, caramel, red bone marrow, Vitamins A and D, and ferric ammonium citrate; *Spoonfoods*, a range of strained homogenised meats, vegetables and fruits; and *Trufood Cereal Food*, a pre-cooked cereal containing added milk proteins, minerals and vitamins.

The company also manufacture ice cream powder and cheese, the cheese plant being an important factor in the manufacture of infant food by supplying the necessary whey.

MANUFACTURE OF "HUMANISED TRUFOOD"

The stages in the manufacture of *Humanised Trufood* are as follows:

1. milk reception and weighing;
2. cheese manufacture and whey extraction.
3. milk separation;
4. pasteurising and compounding;
5. evaporation;
6. spray drying;
7. sieving and packing.

The process is shown schematically on the flow diagram on page 322.

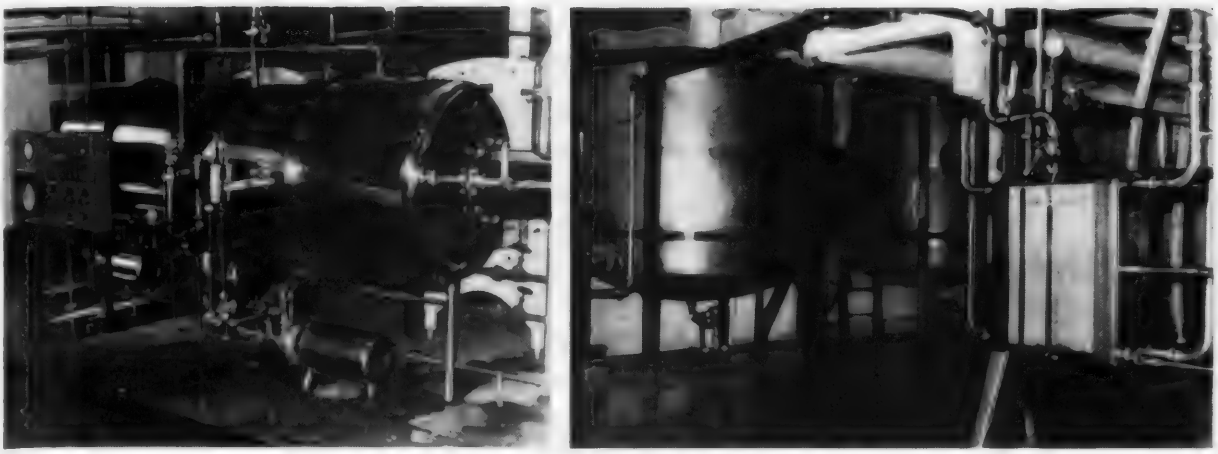
1. Milk reception and weighing

Each supplier's milk is separately weighed and recorded and samples are taken at frequent intervals for laboratory examination which comprises the customary routine tests by qualified chemists. Milk of doubtful quality is immediately rejected.

2. Cheese manufacture and whey extraction

As already explained, the three main ingredients of *Humanised Trufood* are whey, skim milk and cream, and the manufacture of cheese for the production of whey is an essential part of the process. The milk received at the factory is divided into two roughly equal parts, one part going for cheese making and the other for separation into skim milk and cream.

The whole milk for cheese making flows by gravity from the milk receiving platform into two 3,000 gal. receiving tanks, from which it passes via a pre-heater to steam-jacketed vats where its tempera-



(*Left*): **The A.P.V. continuous evaporator which concentrates the milk liquid to 40% total solids content.** (*Right*): **Milk storage tanks and a pasteuriser for the milk which goes to the cheese plant.**

Two of the vats in which cheese is made. In the further vat a travelling agitator is stirring the curdling milk, and in the nearer vat can be seen curd from which the whey has been drained off. (FOOD MANUFACTURE photo.)

ture is raised to 89°F. Pure lactic acid culture, prepared under laboratory control, is added to raise the acidity of the milk. The milk is held for about 1¼ hr. before rennet is added at the rate of 4½ oz. per 100 gal. of milk. Thirty-five minutes is then allowed for the setting of the curd and the temperature is raised to 96°F. The vat of milk is then stirred for about 1 hr. and the whey is pumped off through an A.P.V. plate cooler into storage tanks.

After cutting and re-working to the requisite acidity, the curd is salted at the rate of 2-lb./100-gal. milk and milled into 9-lb. moulds. After pressing for 2 hours at 5-cwt. pressure, the cheeses are turned and replaced in press for a further 12 hours at 10-cwt. pressure. They are then removed from the moulds and dried out for a further 24 hours prior to packing in plastic pouches. The packed cheeses are stored at low temperature prior to despatch.

3. Milk separation

The other portion of whole milk not used for cheese manufacture is preheated to 110°F. in an A.P.V. plate pasteuriser. It then goes through a separator, the cream being pasteurised to 185°F. and then cooled to 45°F., also in a plate-type pasteuriser and cooler, before going to storage tanks. The skim milk is flash-heated to 150°F. and cooled to 45°F. The cooled cream is standardised to 50% butter fat by the addition of skim milk.

The cooled cream and skim milk are stored for a short period in insulated stainless steel tanks.

4. Pasteurising and compounding of ingredients

The main ingredients having now been separately prepared, pasteurising and compounding takes place.

The whey, which is partially neutralised with sodium bicarbonate, is pumped through an A.P.V. plate-type pasteuriser which heats it to 155°F. It then passes through a filter to a holding tank which finally contains the complete mixture.

The required quantities of skim milk and cream are weighed out, and iron is added in the form of ferric ammonium citrate. The skim milk/cream mixture is pumped into the same tank as the separated whey, and agitation with an electric stirrer immediately started. A sample is taken for laboratory testing, and the correct quantity of emulsified vitamin con-

centrate (A and D) is added. The mixture is then pumped through an A.P.V. plate pasteuriser, where it is heated to 175°F., directly into the evaporator.

5. Evaporation

The A.P.V. evaporator was installed last October and operates continuously. The mixture fed to the evaporator has a total solids content of about 9·5% and is concentrated to 42% total solids before passing to the spray dryers. Evaporation is carried out under a vacuum of 28 in. of mercury at a temperature of 120-130°F., and is carefully controlled by recording instruments which record the temperature, pressure and specific gravity of the condensed liquid which passes to the spray drier.

6. Spray drying

The Blaw Knox spray drier was installed in 1959 and was the first of this type to be installed in this country. It operates by forcing the liquid at high pressure through a number of jets into an enclosed chamber which is maintained at slightly reduced pressure. The milk emerges from each jet as a cone-shaped mist into heated filtered air. The water is evaporated off and the milk solids fall as a fine powder which is fully dried by the time it has travelled 4 to 5 ft. through the chamber.

Before entering the drying chamber the filtered air is passed through a heater comprising high and low pressure steam coils, its temperature on entering the chamber being 300-310°F. The air supply is regulated so that the temperature of the outlet air is about 198°F.

The bulk of the milk powder falls to the floor of the chamber and is removed continuously by a worm conveyor. The finer particles pass off in the outlet air stream and are recovered in two series of cyclones. As the powder leaves the dryer it is cooled by filtered air at room temperature, the powder temperature falling rapidly to 80-90°F.

The pump which is used for generating the high pressure in the

MANUFACTURE OF HUMANISED TRUFOOD

Whole milk from Cheshire farms

Samples are tested to ensure that the milk is to the required standard

Quantities are weighed and recorded

The milk is then divided into two parts

TO CHEESE FACTORY

Milk heated to 89°F.
Lactic culture and rennet added to form whey and cheese curd

Curd cut and settled

CHEESE CURD (Used to make Cheshire Cheese)

WHEY

Sample for testing

Cooled and passed to storage vats

Filtered and heated

TO DAIRY

Whole milk preheated to 110°F. and passed through separator

SKIM MILK

Heated, cooled to 40°F. and passed to storage tanks

REQUISITE QUANTITIES OF IRON AND AMMONIUM CITRATE ADDED

CREAM

Heated, cooled to 45°F. and passed to storage tanks

Samples for testing

Bulk standardised to 50% Fat

Preheated

Standardised quantities of these ingredients are compounded to provide the Humanised Trufood mixture with the desired proportions of fat, protein and carbohydrates

Sample for testing

VITAMINS A and D ADDED

PASTEURISATION
Heated to 175°F.

Condensed under a vacuum of 28 ins.

SPRAY-DRIED
in current of filtered air

Sieved

Chemical, Physical and Bacteriological Tests

Packed

Table 2. Comparison of "Humanised Trufood" with human and bovine milk

	Cows' milk	*"Humanised Trufood"*	*Human milk*
Fat	3·7	3·0	3·4
Protein	3·4	1·8	1·3
Ratio of casein to soluble protein	5 : 1	1 : 1·6	1 : 2
Carbohydrate	4·7	6·6	6·9

Addition of iron and vitamins A and D are also made to *Humanised Trufood*.

(*Left*): **One of the packing lines, showing "Humanised Trufood" being packed into cans. The overhead conveyor which keeps the women supplied with empty cans is seen.**

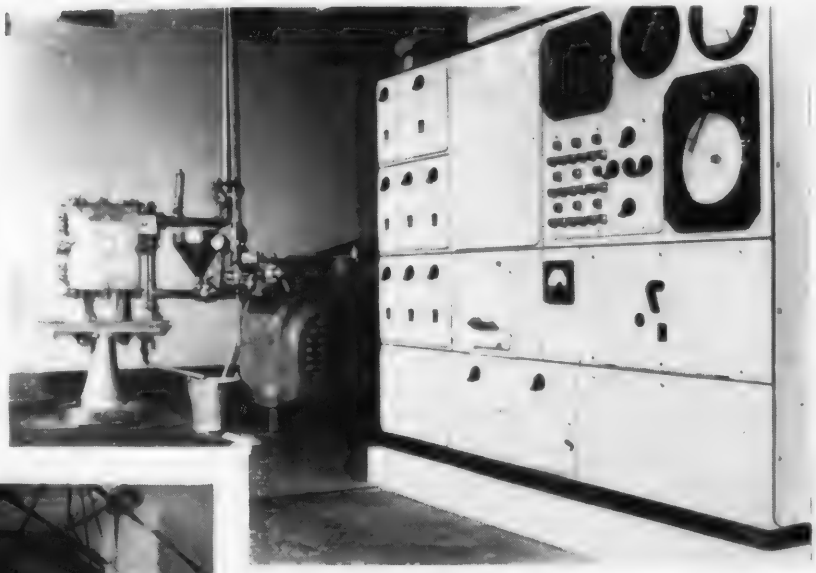
filling machines. There are three packaging lines, which are used independently for tins, cartons and other containers. Milk powders are packed in paper bags, which are enclosed in tins; *Trufood Cereal Food* is contained in heat-sealed paper bags, but these are enclosed in cartons.

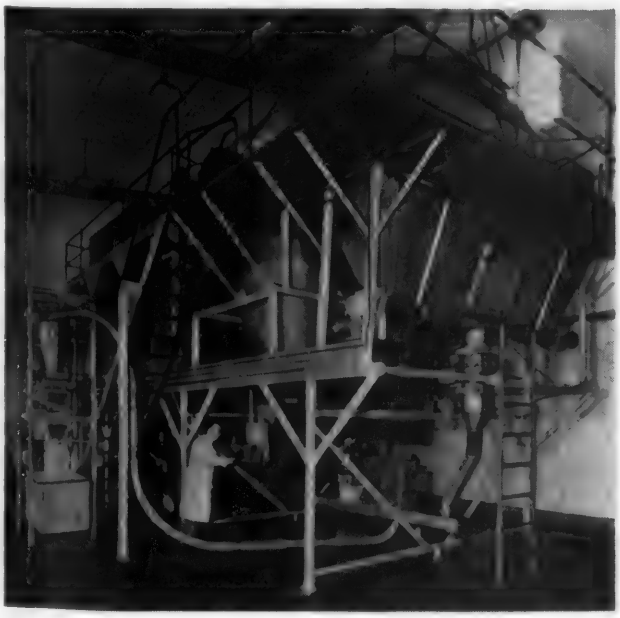
Some of the company's output is gas packed. The tins to be gas packed have a small hole pierced in the base. The filled tins are placed upside down in a Metal Box Co. gas cabinet, which is then closed and evacuated. Nitrogen from a cylinder is then admitted under slight pressure, the cabinet opened, the tins withdrawn and the holes sealed with solder.

milk feed pipe is an A.P.V.-Manton Gaulin pump which forces the liquid through the feed pipe at a pressure of 2,000-3,000 p.s.i. The actual atomiser consists of a small disc of hard alloy steel containing a centre hole about 0·025-0·03 in. in diameter, and a stainless steel baffle with minute holes drilled tangentially at the base.

7. *Sieving and packing*

Before being packed the product is passed through a vibrating screen and is then conveyed to the





(*Above*): **The Manton-Gaulin high-pressure pump which injects the liquid into the spray dryer, and on the right the control panel of the spray dryer.**

(*Left*): **The Blaw Knox spray dryer used for producing "Humanised Trufood" and other infant food powders.**

▶ An illustrated booklet describing plastic finishes for all surfaces by the *Plastinter* process has been published by the Plastinter Co., Ltd.

▶ A six-page leaflet giving details of stainless steel plant for the food and allied trades has been produced by the Longclose Engineering Co., Ltd.

▶ The makers of *Skylon* polythene bottles have brought out a catalogue, illustrated with photographs and diagrams and giving full details of their range of products.

The Royal Forest Factory at Coleford, Glos.

Beecham's switch to Cans for new Soft Drink

One million a week from Europe's largest plant

Opened last April, the new production line at Beecham's Coleford factory produced 10 million 12-oz. cans of "Tango" orange, lemon and bitter lemon carbonated soft drink in its first ten weeks. FOOD MANUFACTURE recently visited this plant, which is described in the following article.

AT the invitation of Beecham Foods, Ltd., and the Metal Box Co., Ltd., we recently saw the new production line for *Tango* carbonated beverage which has been installed at the Royal Forest Factory, Coleford, Glos. This beverage is now produced in three flavours, orange, lemon, and bitter lemon, and present production is running at 300 12-oz. cans per minute, or 1 million cans per week on a two shift per day basis.

THE "TANGO" CANNING LINE

Claimed to be the largest and fastest canned soft drink line in Europe, the plant has been running at this rate since last April. *Tango* in cans was test marketed in London last year, and the firm say that the present plant, although operating to capacity, cannot keep pace with demand.

The manufacture and filling of *Tango* may be divided into three stages:

1. manufacture of the beverage;
2. preparation of the cans;
3. filling, sealing, testing and packing.

These stages are shown diagrammatically in the flow diagram on page 326.

Beverage manufacture

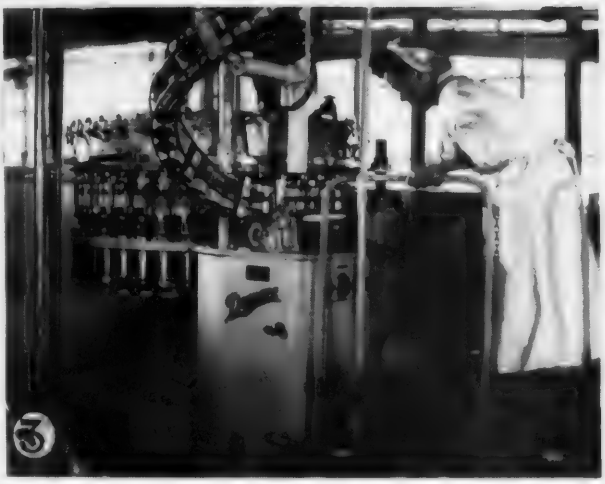
The foundation of all Beecham's soft drinks is a base made from fresh fruit. The manufacture of the fruit base we were not shown. The fruit base is kept in four cold stores, containing a total of 125 stainless steel tanks, each of 4,500 gal. capacity. The stores are kept at a temperature of 5-10°C.

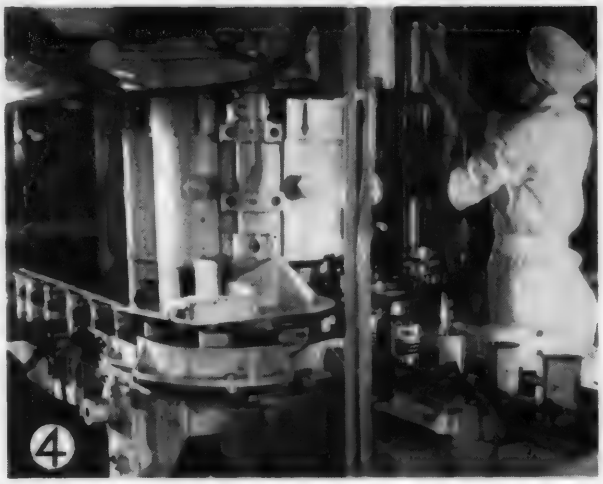
From the cold store the fruit base is pumped to the first floor into four 650-gal. mixing tanks fitted with overhead stirrers, where it is mixed with sugar syrup. The resulting syrup is pasteurised in a small APV plate pasteuriser at 85°C. for one minute and then cooled to 30-35°C. It then flows by gravity to the ground floor to be mixed with water. This water has been de-aerated under a vacuum of 27 in. Hg. in a de-aerator. Mixing with water is accomplished in a Synchro-mix which is fitted with a device preventing the mixing of water and syrup in the wrong proportions.

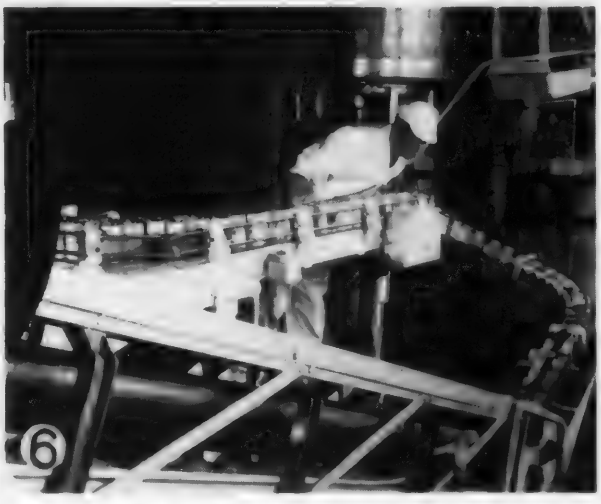
The mixture is simultaneously cooled and carbonated in a Carbo-cooler, in which it trickles over refrigerated coils in an atmosphere of CO_2. It then goes to the filling machine.

Can preparation

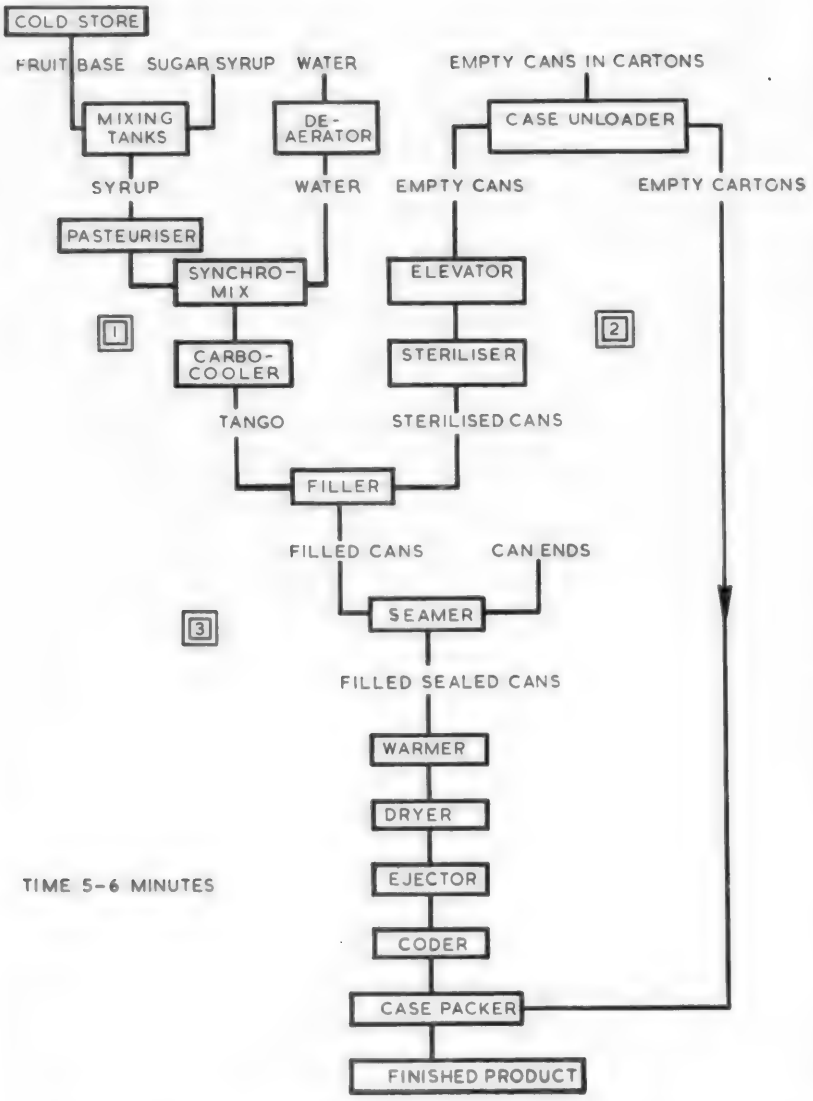
Lithographed cans arrive from the Metal Box Co. in printed cartons. They are tipped on to a case unloader and inspected. Any damaged cans are removed.







These pictures show stages in the manufacture and canning of " Tango " sparkling soft drink at Beecham's new production unit at Coleford. 1. One of the four cold stores in which the fruit base for making " Tango " is stored. These stores contain a total of 125 stainless steel tanks each holding 4,500 gal. 2. In the left foreground is the synchro-mix proportioning-mixing machine which mixes syrup and water in the correct proportion. In the background at right is the packing table, the end of the line. 3. Empty cans passing an inspection point on their way to the filling machine (shown in the background). In the filling machine they are filled to a predetermined level at the rate of 300 per min. 4. Filled cans, on the right, entering the seaming machine which seams on the ends at the same speed. The operator is adding another batch of ends to the stack which supplies the machine. 5. Filled sealed cans leaving the can warmer where, because they are filled at a low temperature, they are warmed to prevent condensation. 6. After leaving the can warmer the cans are shown travelling towards the dryer-elevator in the foreground which removes surplus water by air blasts.



The empty cans are then raised by elevator to a steriliser in which the inverted cans are sprayed with hot water while being taken through a rising spiral. They then pass to the filling machine.

Meanwhile the empty cartons are taken by conveyor to the case packer at the end of the filling line.

Filling and packing

In the filling machine the sterilised cans are filled with beverage to a predetermined level at the rate of 300 a minute. The temperature of the beverage at this stage is 2-5°C.

The filled cans now go to the seamer, which is operated as a single unit with the filler and works at the same speed. Here a jet of CO_2 is introduced into the filled can immediately before the can end is sealed on. This displaces all but a small amount of air from the can headspace. Low air content helps to inhibit internal corrosion and to maintain the quality of the product during its shelf life.

The product is filled at a low temperature and to prevent condensation of atmospheric moisture the cans must be warmed after being filled. The filled sealed cans therefore pass to the warmer, where they are warmed with hot water jets and their temperature raised to 20°C. The cans pass through the curtain of water inverted and any which have not been properly seamed, leak. Such low-filled cans are later rejected by an ejector coupled to an X-ray scanner.

The warm wet cans now pass up the inclined dryer and are dried by air blasts. They then pass the X-ray scanner. Any variation below the predetermined filling height triggers off an air blast which neatly removes any can which has been low-filled or which has leaked.

The cans next pass to a coder which stamps them with a code mark indicating the date and batch number.

The line of filled and coded cans now meets up with the empty cartons in which the cans originally arrived at the factory, and a case packer loads the cartons with the cans. During the packing operation a layer pad and supply of can piercers are added and then the cartons are glued and closed. After going through the compression unit the cartons are palletised for national distribution.

▸Conveyor beltings for the food and allied industries are described in a leaflet produced by Turner Brothers Asbestos Co., Ltd.

▸Publications No. 1737, dealing with concentrating evaporators and atomisers, and No. 1738, on palletisers, have appeared from Babcock and Wilcox, Ltd.

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A Sensory Quality Index for Margarine

By Damazy J. Tilgner*

Sensory testing of food is, and likely to remain, the most important method of quality assessment. This article, based on a paper presented at the 5th Congress of the International Society for Fat Research held in Gdansk, Poland, from September 21-25, 1960, *describes a method of assessing margarine quality by blending it in various ratios with prime butter and comparing the blends with a prime butter control sample. Taste panel requirements are discussed.*

THE importance of modern methods of quality control for food products has greatly increased during the past twenty years. As our methods for the identification of the trace components responsible for delicate differences of flavour and aroma are still inadequate, it is generally agreed that sensory tests are unlikely to be replaced in the near future. As sensory testing is a necessary part of production control truly objective procedures are important for assessing the quality of margarine.

THE DILUTION INDEX

This index offers an objective and reproducible scale for assessing the flavour quality of margarine. It depends on the use of prime quality butter as a constant control and as an arbitrary standard of comparison.

The method consists of the addition of the test margarine to prime butter until the ratio is such that the mixture is just distinguishable from the prime butter control sample. The higher the dilution index (the ratio % margarine to % butter) the better the quality of the margarine test sample. Thus the scoring is based on the flavour difference threshold of the individual tasters in detecting differences, rather than in judging absolute flavours or in determining which of two samples is preferred (see Table I). This dilution index has been used in the Department of Animal Products Technology for many years as a method for assessing the flavour quality of many food products.[5, 6, 7, 8]

* Department of Animal Products Technology, Politechnica Gdanska, Poland.

(*Above*): **Mr. Harry Gates, refinery manager, and Mr. Ron Bagley tasting the finished refined oil at the Purfleet margarine works of Van den Berghs and Jurgens, Ltd.** (*All photos are by courtesy of Unilever, Ltd.*)

Preliminary determinations

A preliminary evaluation of margarines of unknown quality must be undertaken in order to determine the approximate dilution index and so avoid the need for the panel to taste samples at the whole range of levels. Thus samples at dilution indexes of 40, 60 and 80, together with a reference butter sample, are first presented. The

instruction sheet 1 reads as follows:

(1) Score on the scale shown the degree of flavour difference you are able to detect in each of the samples submitted in comparison with the reference sample. The reference sample may be tasted whenever desired.
(2) Indicate whether the sample is to you acceptable or unacceptable in terms of flavour.
Sample No. .....
Score: 1 2 3 4 5 6 7 8 9
(Difference): None: Slight: Moderate: Large: Extreme.
Acceptable? No/Yes

Table I. Flavour Indexes for Margarine by the Dilution Index Method

*Dilution Index**	*% Butter in butter/margarine mixture*	*Quality description of test margarine*	
100	0	90-100	Excellent
90	10		
89	11	80-89	Very good
80	20		
79	21	60-79	Good
60	40		
59	41	40-59	Medium
40	60		
39	61	20-39	Poor
20	80		
19	81	1-19	Very poor
1	99		

* Established by the sensory difference test.

Sample preparation and assessment

The requisite proportions of butter and margarine are blended by grinding in a porcelain mortar for 10 minutes, placed on a glass plate and formed into a cube. This is kept at 4°C. for 30 minutes, cut into smaller cubes, coded and served to tasters for evaluation either according to the preliminary determination method or in the final test.

In the duo-trio method[3] the standard butter sample is first presented as Control A. The taster then receives a pair of coded samples under key, *i.e.* an A and a B sample, in random order, and is invited to select the "different," *i.e.* the B, sample. This is the butter/margarine blend, and the dilution index is based on the ability to differentiate it from the Control, A. The time interval between presenting the Control A and the two samples A and B can be varied as desired with the object of obtaining reproducible results. With a panel of six persons at least, three dilution indexes may be established by this method in an hour.

General requirements

Sensory testing should be carried out very carefully to ensure the validity of the results[7, 9]. Proper facilities must be provided for tasting, and the panel carefully selected and trained.

When margarine, butter, edible oils or similar fatty products are tasted the palate must be cleansed between tastings to remove the cloying sensation caused. This can be done with aged white bread or warm strong tea. Environmental conditions and the taster's physical state influence the results. The taster must be in a good physical and calm mental condition, and unaffected by emotional factors such as nervousness or excitement. Though reasonably hungry, he should not be affected by extreme hunger or by cold or fatigue. Panel members should have high sensitivities to odour and flavour, and low thresholds.[8]

Tasters should be methodically trained to detect small quality and intensity differences. When such small differences are to be detected considerable concentration of attention is necessary; hence interest, and competition between tasters, must be developed.

In order to eliminate identification by colour samples should be presented under a yellowish-brown light. The time of day at which tasting is carried out should be standardised; from 11 a.m. to 1 p.m. is likely to prove the best time.

Selection and size of panel

For routine quality difference assessment trained expert panels of five to seven tasters are recommended, tasting results to be always in duplicate. The members of the panel, selected for their ability in tasting butter and margarine and capable of detecting small differences, should be chosen by a sequential statistical procedure.[4, 10]

Just as it is necessary to determine the sensitivity of an instrument before use, it is also necessary to determine the sensitivities of individual judges in terms of their abilities to detect consistently real odour and flavour differences.

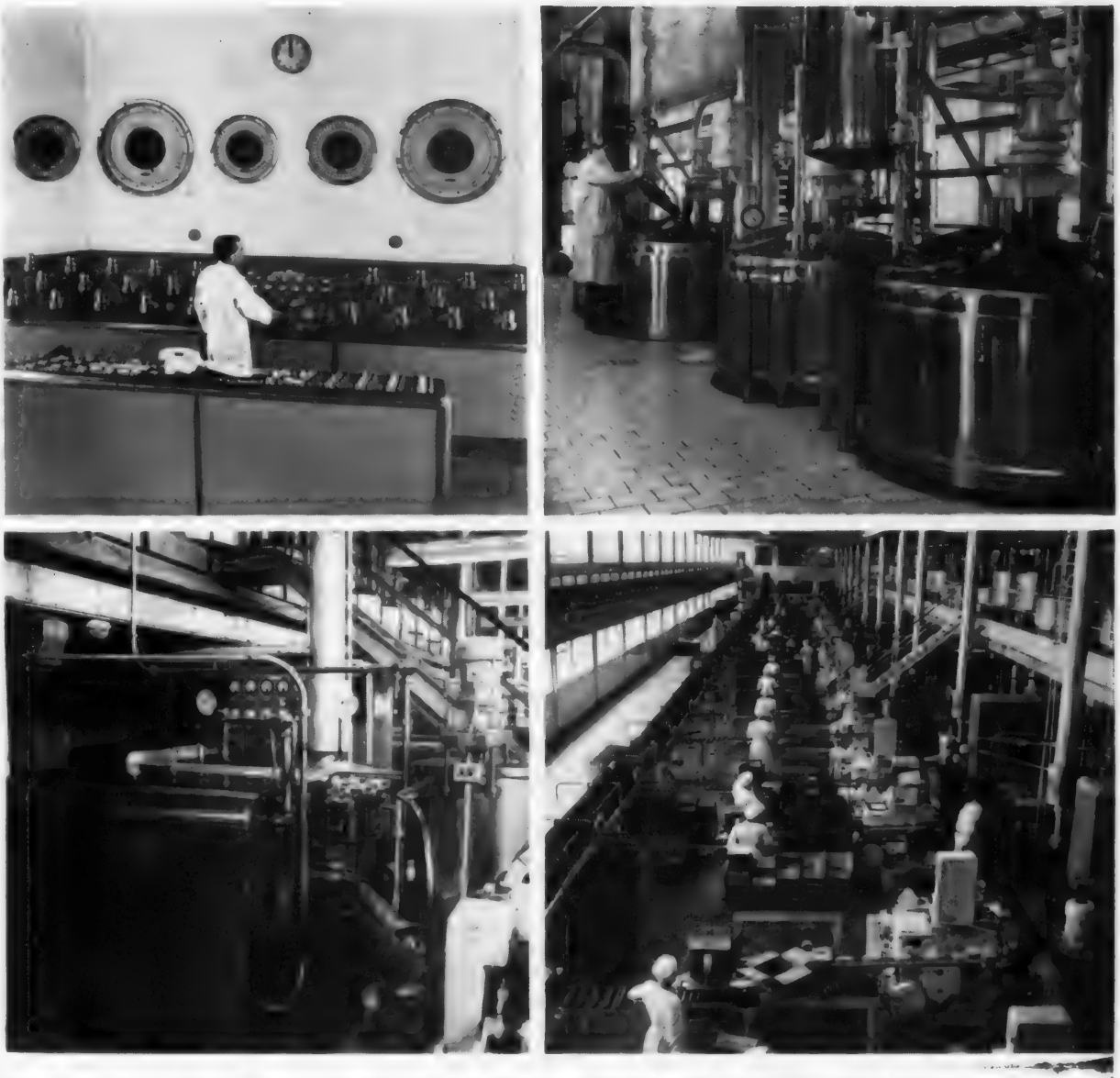
The duo-trio test, the triangular test[2, 5] and the multiple comparison test[1] are recommended for checking individual sensitivities. A difference of 10-15% of the threshold value should be detected consistently.

Individual performance should be re-evaluated periodically, and members of the panel retained only if their skill in difference testing remains adequate. Members of the panel consistently detected 20% decreases in the amount of Polish milk margarine blended with the control butter. They merely reported unknown samples as the same or different.

Quality variations on the market

The writer met only once, during his 35 years of professional activity as a food technologist, with a margarine sample which had a dilution index of 100. This was served anonymously at the banquet of a dairy industries Congress, in place of prime butter. Although many professional butter tasters participated at the reception, no one detected it.

Most margarines encountered unfortunately have a low flavour dilution index, due to undesirable flavour notes which adversely influence the palatability of this valuable fatty spread. For recent samples of freshly made milk margarine, dilution indexes of 30-



These photos show stages in the manufacture of margarine at the Purfleet works of Van den Berghs and Jurgens, Ltd. (*Top, left*): **The compounding panel. Each type of margarine has its own special recipe. Here, at the compounding panel, a skilled technician measures out the exact quantities of the different oils and fats into the pre-mixing tanks.** (*Top, right*): **The stainless steel pre-mixing tanks where fat-free milk, salt and vitamins are added to the oil-fat blend and the whole thoroughly mixed before going to the votator.** (*Bottom, left*): **One of the votators in which the margarine is conditioned under refrigeration.** (*Bottom, right*): **A general view of the votator department, showing the votators on the right, from which the margarine emerges to the portioning and wrapping machines. The wrapped portions are packed in cartons for transfer to the despatch department by the conveyor on the left.**

40 have been established by this Department, whilst for plain margarine the figure is 20, or even less.

Salt contents below 2% improve the overall flavours of both butter and margarine without allowing the salty note to dominate the flavour impression. In the case of higher salt contents the degree of saltiness,[6] in terms of a sensory perception, may be established and controlled by a saltiness index in the same way as in meat and fish products.

Conclusions

The variability of butter is of some disadvantage in the method described: however, if prime butter only is used a clearly-defined flavour profile is achieved, and this should also be the objective of the margarine manufacturer.

Products intended for human consumption should be guaranteed to be of sensory quality and palatability. Such a guaranteed quality serves as a standard both for producers and consumers. It may be hoped that manufacturers' claims relating to margarine

(*Concluded on page 333*)

NOMOGRAPH
for margarine and fat hardness determination

By D. S. Davis*

FOR the determination of the hardness of margarine and fats by means of the cone penetration method with the standard apparatus as described in References 1-5, Haighton[6] developed the equation

$$C = \frac{KW}{1.6}$$

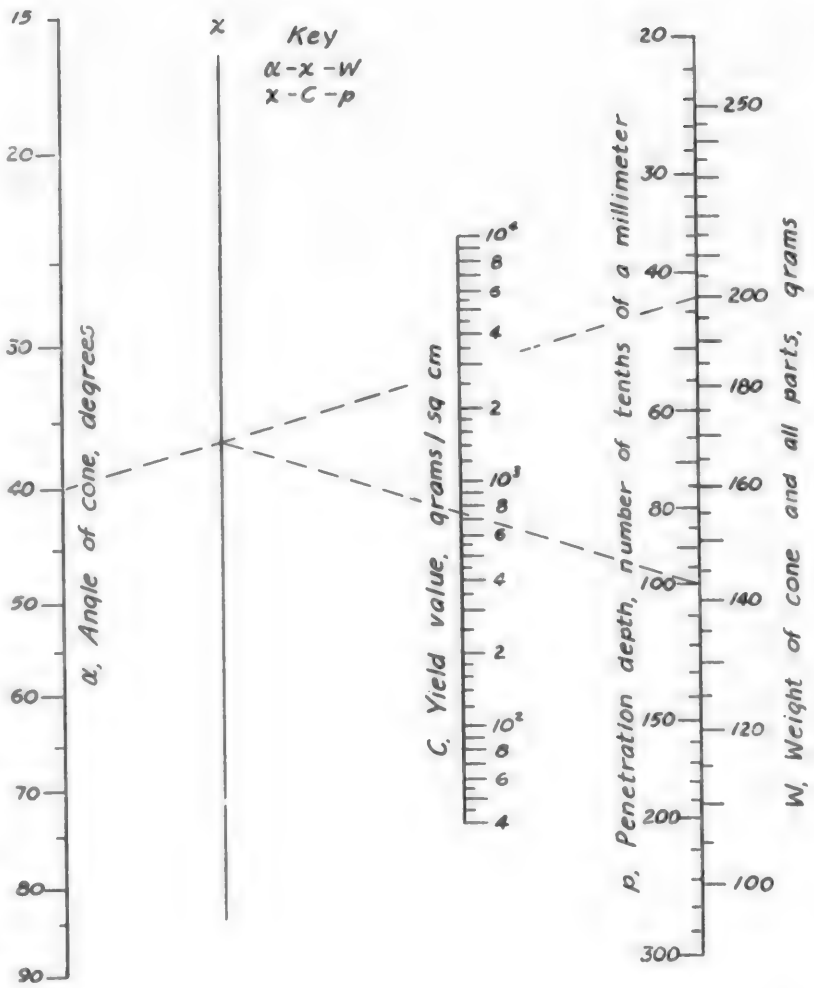
where C = yield value of the margarine or fat, grams sq. cm.
K = factor dependent on the angle of the cone
W = weight of cone and all parts, grams
p = penetration depth in 10ths of a mm.

This equation can be solved quickly and accurately by means of the accompanying nomograph, constructed in accordance with methods described previously.[7]

Use of the chart is illustrated as follows:

What is the yield value for a margarine when the angle of the cone is 40°, the weight of the cone and all its parts is 200 g., and the penetration depth is 100 tenths of a millimeter?

Following the key, connect 40 on the α-scale and 200 on the W-scale with a straight line and mark the intersection with the x-axis. Connect this point and 100 on the p-scale with a straight line and note the intersection with the C-scale at the desired value of 740 grams/sq. cm.


Key
α-x-W
x-C-p
α, Angle of cone, degrees
C, Yield value, grams/sq cm
p, Penetration depth, number of tenths of a millimeter
W, Weight of cone and all parts, grams

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* University of Alabama, U.S.A.

▶ The properties of and products made from I.C.I. silicones are detailed in a booklet issued by Imperial Chemical Industries, Ltd.

Russians claim New Margarine resembling Butter

A CONFERENCE was held in Kiev last year which was attended by representatives of technical, commercial and Government bodies concerned with the maintenance of food quality in the Soviet Union. Reports on quality standards for margarine fats, new apparatus and emulsifiers leaving no after-taste were presented and discussed.

It was mentioned that in recent years the quality of margarine products had improved and several measures were proposed to ensure better quality, such as improved grades of edible salomas (hydrogenated vegetable oil, mostly sunflower seed oil); use of dry heated salomas; application of dry heating methods to other edible fats; more efficient cold storage and automatic measured feeding of margarine components.

These and other improvements have been adopted in some factories, but there is still room for such improvements as continuous flow line and automatic methods. Various factories reported their experience in these and other fields. An announcement by the Odessa Sov-Nar-Khoz was given concerning whaling enterprises based on the port and the production of whale oil products; salomas made from whale oil are used for margarine and edible fat. The Ukraine Research Institute for the Oils and Fats Industry is continuing work on phosphatide solutions and emulsions for use in margarine production and has in hand work on improving margarine flavour and general quality.[1]

Part of the margarine works in Stalino, a major food processing enterprise in the Donetz Basin. This factory has a daily output of 50 tons.

New margarine resembling butter

For many years, work on the production of margarine closely resembling butter in structure and taste has been carried out, and a summary of results so far has recently been given, together with the general lay-out of the latest plant, of which there are two types.

The method, based on the formation of an emulsion of the water-in-oil type, using a water/milk phase with a fatty base in the presence of a fat-soluble emulsifier, has been tried out on an industrial scale in the Moscow margarine works, in continuous flow-line plant. In the first type, using a separator, 40% artificial cream mixtures, fat base and lactic plasma are mixed in a churning machine, with addition of emulsifier and homogeniser. The cream is pasteurised. The emulsion thus obtained contains 82-83% fat.

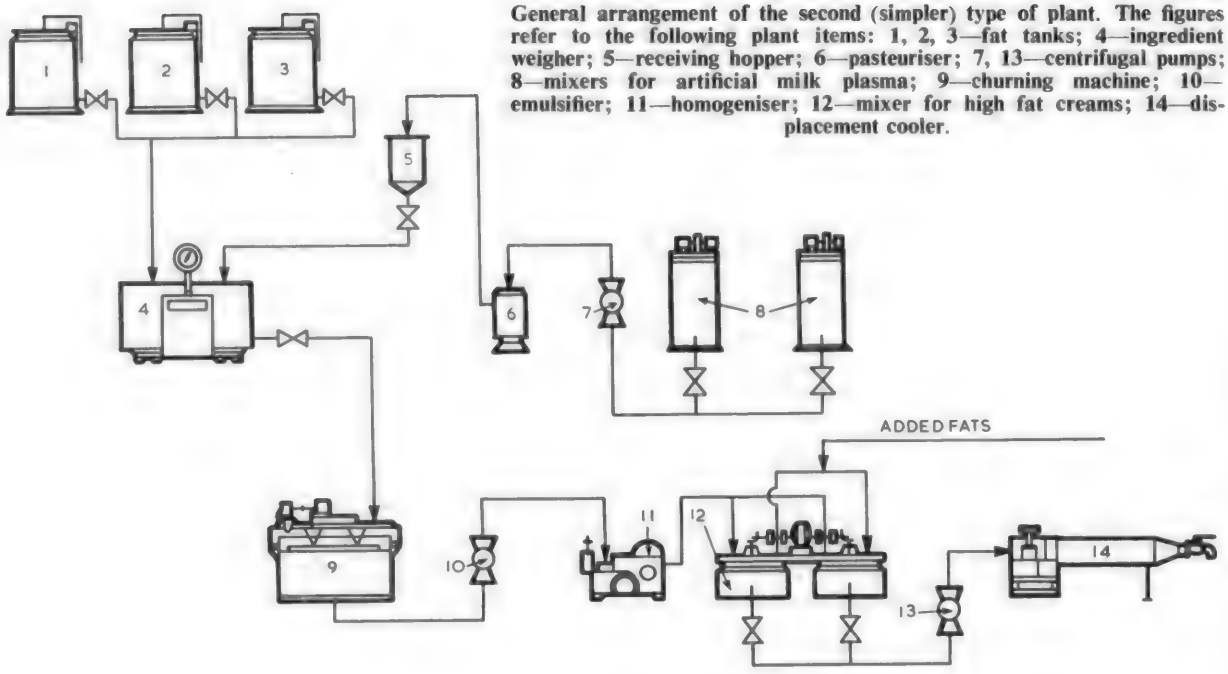
The composition of the artificial cream used is as follows:

	%
fat	40·0
dry defatted milk powder ...	1·5
di-sodium phosphate ...	0·2
tri-sodium citrate	0·1
salt	0·6
water	57·6

In the second and simpler type, without separator, 60-70% creams are produced by mixing the fat base and milk plasma in the churning machine, emulsifying in appropriate machine and homogeniser, followed by the actual margarine production from an emulsion containing 82% fat, including necessary cooling. Compositions of two of the artificial creams are as follows:

	(a)	(b)
fat	60·0	65·0
dry defatted (or full) milk ...	2·0	1·75
di-sodium phosphate	0·15	0·14
tri-sodium citrate ...	0·05	0·03
salt	1·0	0·70
sugar	1·0	0·70
water (or natural milk)	35·8	31·68

The water constituent may be replaced by natural milk, thus improving the taste of the new product. The fat basis, with a melting point of 27-29°, is prepared from a special formulation adapted to margarine production. The dried milk, in the composition of which is a large proportion of albumen/casein, is used as emulsifier for producing stable emulsions. The sodium salts of citric



General arrangement of the second (simpler) type of plant. The figures refer to the following plant items: 1, 2, 3—fat tanks; 4—ingredient weigher; 5—receiving hopper; 6—pasteuriser; 7, 13—centrifugal pumps; 8—mixers for artificial milk plasma; 9—churning machine; 10—emulsifier; 11—homogeniser; 12—mixer for high fat creams; 14—displacement cooler.

and phosphoric acids facilitate the more complete transfer of the milk albumen into soluble form; and also raise the *p*H of the medium to a value more satisfactory in regard to the iso-electric point of albumen. In using the second type of plant the sodium citrate may be omitted; but its use is desirable for stimulating development of the desired form of lactic acid bacteria.

Among the constituents is lactic plasma, prepared at 75-77° by dissolving its component parts and filtering to remove suspended particles, pasteurising at 85-87°, and cooling down to 40°. The plasma and fat base at 40° are subjected to a very thorough mixing and dispersion in the churn (kirn) machine and emulsifier (the Russ. *kirn* is not given in any of half a dozen dictionaries and is presumed to be churn). The pressure used is 20-25 atm. A stable non-separating dispersion is obtained as shown in the table.

The stability of the dispersions obtained was tested by centrifuging at 1,500 r.p.m. for 5 min. The extent of dispersion was determined microscopically.

The flavour of the margarine thus produced depends in large measure on that of the substances forming in the pasteurisation of the milk and souring of the concentrated creams.

In the production of margarine by the method described by Dr. V. M. Bogdanov[2] tests were made of lactic ferments of the following mixes:

1. *Str. lactis* 220, 294, 189; *Str. lactic diacetil* 13_7 K_2 C_1;

2. *Str. diacetilactis* N 13; *Str. lactis* N 23x; *Str. cremoris* N 61x;

3. *Str. diacetilactis* K_2 C_1 $13C_{67}$; *Str. lactis* 352, 382.

Tests with all these gave good results. The 60-70% artificial cream obtained was transferred to an apparatus fitted with a mixer running at 150-200 r.p.m., the lactic ferment (1-2% of weight of prepared product) was introduced, and fat added to make up to 82%. With the mixer at the stated speed a good stable emulsion was obtained.

The highly concentrated cream (with not less than 82% fat) formed a highly stable emulsion of the oil-in-water type. Its conversion into margarine proceeded by cooling the cream during crystallising of the fat, "destabilising" the emulsion, and mechanical treatment. A displacement or expeller cooler was used, and in passing through this the cream was at the same time stirred up, cooled, partly destabilised, and changed in structure similar to that of butter. Temperature of cooling is important, and should be within the limits of −8° and +1°C. For the finished product coming from the cooler the limits would be 9 to 13°C., according to the m.pt. of the fatty base.

Demulsification and crystallisation of the fat and the simultaneous mechanical treatment of product, with partial breakdown of crystal structure in this method, are completed in the cooler. The finished product for some time after coming from the cooler continues to set or solidify, and

Table I. Emulsion characteristics

Homogenisation pressure (atm.)	Fat content %	No. of fat globules in % size in microns					
		<2	2-4	4-6	6-8	8-10	>10
20	60	34.0	40.1	22.2	2.3	1.4	—
25	60	38.5	39.0	20.1	1.8	0.6	—

acquires a plastic condition. Refrigerator cabinets for final solidification should be kept at 0-6°C.

In studying the structure of the new margarine samples of it and of butter under works conditions were analysed and compared. The test samples were held for 30 days at 15-18°C. in a fat-soluble dye, Soudan III, and in a water-soluble dye, methylene blue. Depth of penetration of colour was then measured. The samples were also held in a 15% aqueous solution of sodium chloride. To determine the NaCl content three layers each of 0·5 cm. thickness were cut from the test samples. Observations were made over 30 days.

The results are said to confirm that butter and the new margarine have the same micro-structure. In this they differ from ordinary factory made margarine. The new margarine is superior to the latter in taste, though both are made from the same constituents; it is superior also in lower melting point, good plastic qualities, and general consistency.

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(*Concluded from page 329*)

quality will be increasingly based on objective sensory assessments making use of the dilution index.

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BOOK REVIEW

Food Irradiation

This book* aims at bringing together physical and biological sciences in order to provide a background to some positive applications of atomic energy in the fields of food, agriculture, and biology. For example, it is well known that high level irradiation can destroy a nutrient such as vitamin C. On the other hand, it may not be recognised that vitamin C can be synthesised by means of radiation.

This A.V.I. publication is a further addition to an established series on food processing and introduces radiation technology to this field in a comprehensive manner. Desrosier was the author of a previous publication on the Technology of Food Preservation.

The information provided is likely to be of interest to biologists, food technologists (particularly those concerned with the application of radiation techniques to food processing), chemists, biochemists, agriculturalists, physiologists and to some extent the medical profession. The authors are well qualified by reason of their respective industrial experience and have made this presentation constructive. The chapters are clearly set out in good print together with a number of photographs, diagrams, illustrations and data tables.

The work is divided into four parts dealing with: Introduction to Radiation and its Effects; Radiation Source Technology; Interaction of Radiation with Living Organisms; and Radiation Processing Technology. The first part consists of five chapters covering such topics as the structure of atoms, molecules and nuclei; radioactivity, chemical reactions induced by radiation and the physical effects of radiation. This leads to considerations on radiation sources and measurement of the radiation dose.

The most lengthy parts are probably III and IV; the former deals with the effects of radiation on water, organic compounds, biological polymers, living cells, plants and animals. On the other hand, part IV is devoted to food technology relative to the role of radiation to its industrial application to pharmaceutical products, the bulk medical supplies. The chapter on food irradiation describes the four main categories of radiation treatment, *i.e.* sprout inhibition, insect disinfestation, pasteurisation and sterilisation. Industrial radiation technology, pp. 345 to 354, is not at all detailed and serves only to illustrate the sort of outlets which may well be developed with time.

Bibliographies are included at the end of each chapter, and in some cases these are extensive, although mostly with respect to work carried out in the U.S.A.—J. G. KENNEDY.

* *Radiation Technology in Food, Agriculture and Biology*. By Norman W. Desrosier, PH.D., and Henry M. Rodenstock, PH.D. Avi Publishing Co., Inc., Westport, Conn., U.S.A., 1960. Pp. 401.

The Why and the How of FILTRATION

Clarity problems from the production angle

As an introduction to our review of filtration equipment, we thought it would be interesting to approach the problem of process filtration from a filter manufacturer's point of view. This short article therefore touches on the aspects of filtration which directly concern the manufacturer who makes filters for specific purposes, and which must therefore be presented by the food processor when he has a filtration problem.

WE assume that a production unit has a specific filtration problem and that preliminary laboratory experiments have been completed. These experiments will have indicated the kind of filtration technique to be used and the material of construction for the contact parts of the equipment. Materials are various and can include mild and stainless steel of various grades, copper, gunmetal, ceramics and coatings of various kinds.

What the filter manufacturer must know

Decisions on these points will probably narrow very drastically the choice of filtration equipment, and the next step is to approach the filter manufacturers. These require to know viscosities, temperature limitations, *p*H values, required throughputs, filtration cycles to be expected, degree of clarity required, and special types of filtration media that may be used, and generally any particular behaviour under given temperature, pressure and flow conditions.

Types of equipment

Filters can very roughly be grouped as follows:

1. by the force under which they operate, *i.e.* by gravity, pressure, centrifugal force or vacuum;
2. by the type of filtration media used, *i.e.* proprietary filter aids, papers or cloths, woven wire screens and the various kinds of more open mesh screens for straining, pulping, etc.

Types of filtration units in common use in the food industry include filter presses both hydraulically and manually operated, horizontal and vertical disc types, vertical woven screen types, filters with elements of either the wire bound core or spaced disc type, porcelain element type, rotary vacuum drum filters, string discharge filters, and others.

In attempting to look further into how the filter manufacturers approach filtration problems we talked to the Calmic Engineering Company of Crewe, who tackle them in a practical rather than a theoretical manner. Like many of their competitors, they undertake pilot scale tests on the customer's premises, a specialist from the company carrying out the actual tests in the presence of interested members of the customer's staff.

This method of testing under the supervision of the filter maker's representative rather than the alternative of merely

A Calmic high duty pressure filter.

"Sparkler" filters made by L. A. Mitchell, Ltd., used for filtering edible oils at Loders and Nucoline's plant, showing one of the cartridges lifted for inspection.

loaning the test unit is done for two reasons. First, the operator from the filter manufacturing firm has generally a broader outlook on the problem than the factory operator and is often able to put forward constructive suggestions born from experience in other industries, which often use similar techniques. Secondly, it does ensure that the filter is being correctly operated and not being abused by excessive pressures, etc., which is often the case with a loan.

Pilot scale tests

This pilot scale test enables the company to assess accurately the size of unit required. The test unit is a 3 ft.^{2} model and is simple to operate; it consists of a cylindrical body into which is dropped the filter element.

The element is a series of circular filter plates covered with paper or cloth, or with pads, and stacked vertically. The plates are held together with tie rods. In operation the liquid passes up the centre of the element and thence through the filter medium being used, so that only clean filtrate comes into contact with the main body, leaving the residue in the form of a cake in the element itself. The pressure is also confined to the element, ensuring a negligible pressure in the main body.

The filter is thus able to be cleared with compressed air or gas without the use of a scavenger plate, especially invaluable when expensive or dutiable liquids are being used. The contact parts of the filter can be sterilised before or after assembly and readily cleaned after use.

Specific problems

Some of the problems which such a pilot plant can handle are commonly met with in the types of product listed below.

1. Beers, lagers, etc.

These are normally handled by a double filtration. In the first filtration or "roughing out" the yeast cells, protein matter and other debris are filtered out to a fairly bright degree. The filtrate is then passed through a filter fitted with polishing sheets, normally in conjunction with a very fine filter aid which must impart a high enough finish to give the product several months shelf life. The CO_2 content must naturally be retained during the filtration.

2. Wines, ciders, vinegars, etc.

These can often be filtered in one pass, provided that settlement in the vessels is fairly complete. If not, a double pass will be necessary. Here again shelf life is often the criterion.

3. Spirits

Although reasonably easy on the whole, these can be awkward; this is especially the case with rums. Precipitation often occurs in spirit blends which has to be filtered off. The finished article must be brilliant.

4. Sugar Syrups, etc.

These, both for soft drinks and confectionery, are filtered in a variety of finishes, all at varying temperatures. It is interesting to note that decolorisation is possible during the filtration. The main danger is that if filtration is not complete the likelihood of fermentation is increased.

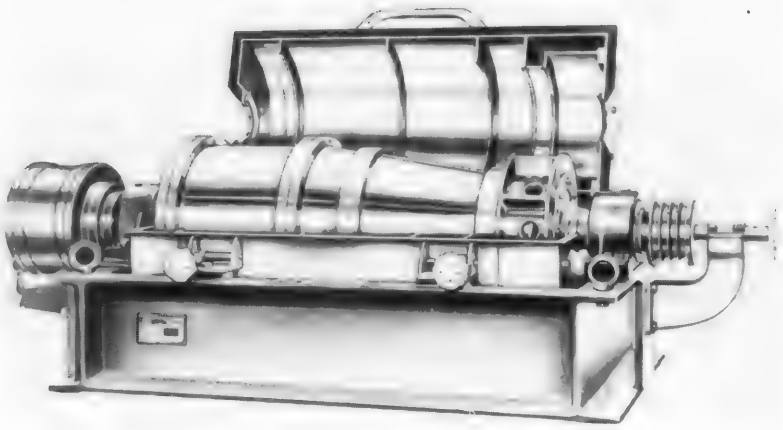
5. Sugar scrap recovery

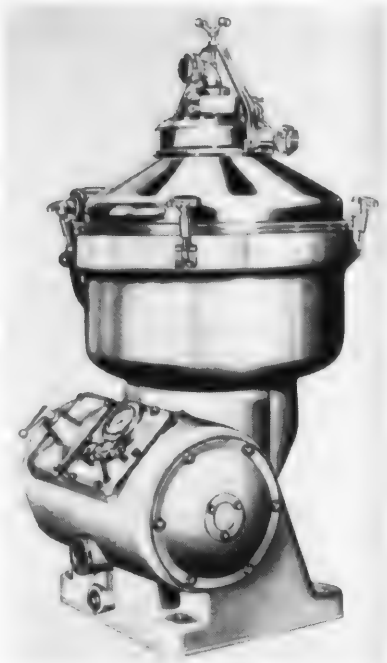
This process, common in the confectionery industry, comprises the reprocessing of deformed boiled sweets which often require decolorising and filtration before re-use. Flow rates vary according to the nature and amount of solids being filtered out.

6. Fats

Fats such as lard are reasonably easy to filter because of the tem-

(Concluded on page 338)





(*Above*): **De Laval desludger for the continuous coarse filtration and concentration of solids.** (*Right*): **De Laval hermetic separator for the clarification and separation of liquids and solids under pressure and without air contact.**

PROCESS FILTRATION—

equipment and makers

Centrifugal clarification

CENTRIFUGAL clarification offers many advantages for a wide variety of filtration problems in the food industry. De Laval high-speed centrifugal clarifiers, supplied by **Alfa-Laval Co., Ltd.,** offer the advantages of quick and continuous clarification, and they require a minimum of space and manual supervision. By using centrifuges there is no costly use of filter earth and no laborious cleaning of filter cloths. They are available in many designs suitable for straightforward and more difficult clarification problems.

When the amount of solids to be removed from a liquid is small, standard clarifiers give a continuous clarification of the liquid while the solids removed are retained in the centrifuge bowl; this must be stopped for cleaning from time to time and the cleaning operation takes 15-30 minutes.

For liquids with a higher solid content, "self-cleaning" clarifiers are recommended. The separated solid in these machines can be discharged while the machine is running at full speed. Consequently there are no shut downs for bowl cleaning, and off-stream time is only a matter of seconds while the solids are "shot" from the bowl. These machines can be controlled by an automatic timing device which makes manual supervision during operation unnecessary.

For handling liquids which are inclined to foam, "enclosed" separators are used, in which the clarified liquid is discharged under pressure. In addition, De Laval machines are also available in fully hermetic construction for treating liquids in a fully sealed system under pressure, and without air contact. The foregoing types of machines can also be arranged to separate two immiscible liquids and solids simultaneously. Typical applications in the food and allied industries are the clarification of animal fats, butter, cocoa butter, frying and canning oils, fruit juices, syrups, beer, wort, alginates, etc.

A range of De Laval nozzle separators are designed for treating liquids with a higher solid content, and are used for such problems as effluent clarification, starch concentration and washing, yeast, protein, fish solubles, etc. These machines operate fully, continuously discharging solids in the form of a concentrated cream. Machines are available with capacities up to 20,000 g.p.h.

For coarser filtration De Laval desludgers are used. These machines are horizontal centrifuges with an internal helical screw which conveys solids continuously in a very concentrated form from the machine. Desludgers are used for separating and concentrating

such materials as proteins, carbohydrates and starch, fractionation of cocoa mass, etc., and are frequently used as pretreatment machines prior to nozzle separators.

In addition, De Laval in-line strainers are available for the removal of extraneous matter in the process stream. These can be of the single or dual cage type. Also, high capacity brush type strainers are offered for such duties as prestraining starch milk, fruit juices, etc.

Filter presses for sugar syrups

Filter presses made by **William Brierley, Collier and Hartley, Ltd.,** have been designed specifically for the filtration of fruit juices, fruit pulp and sugar syrup. Chambers and filter plates can be supplied in various metals, chief of which are: aluminium silicon alloy, for fruit juices and pulps; cast iron and galvanised cast iron, for sugar syrup; bronze and monel metal, for certain fruit juices; as well as stainless steel, wood or nylon.

The solution to be filtered is usually blown through the press from an autoclave or receiving vessel by compressed air. The depth of the chambers used depends on the solution being filtered, so they are made in three thicknesses: 1½ in. for coarse filtration of fruit pulps; 9/16 in. for fine filtration of fruit juice; and 1 in. for sugar syrup.

Bowl filters

Stainless steel bowl filters of an interesting design are manufactured by **C. P. Equipment, Ltd.** The filter employs circular diversion plates with spider supporting plates through which pass a distribution tube. The assembly is housed in a cylindrical casing with domed top. This type of filter is particularly versatile in application since the filtering elements which are inserted between the diversion plates and the supporting spider plates can be filter paper, cotton filter cloth, standard or special woven wire cloth or gauze or of perforated stainless steel.

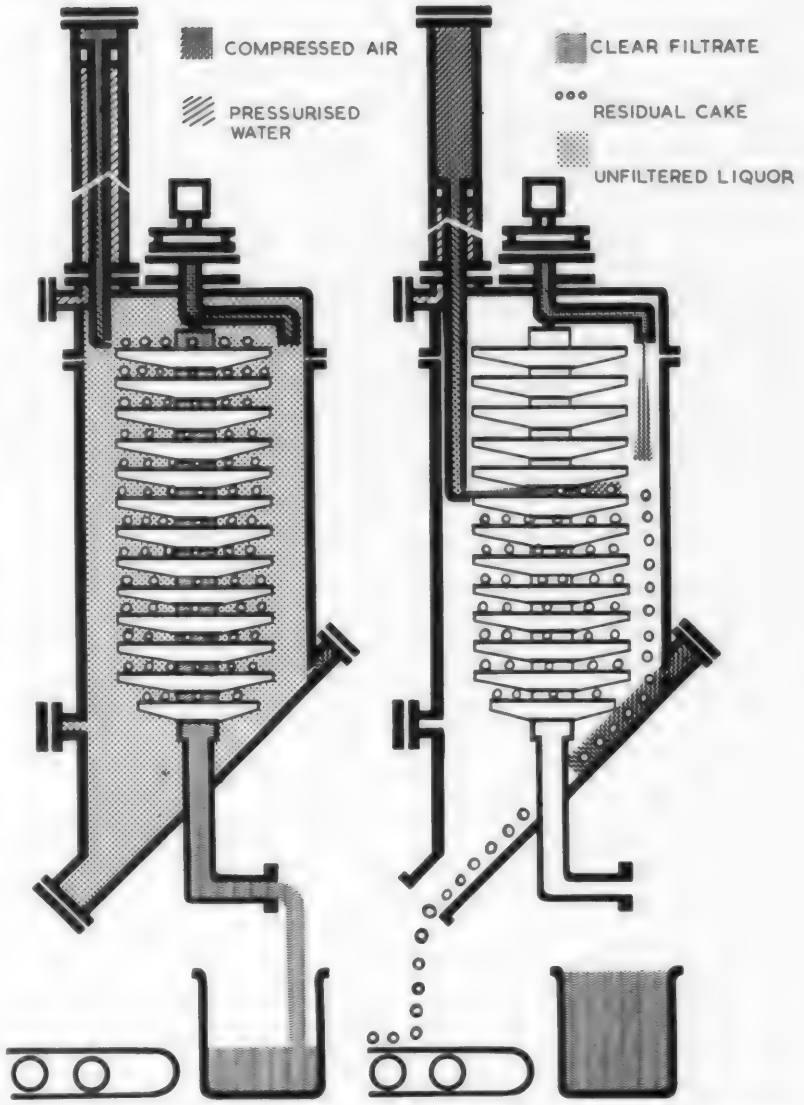
The lower bowl of the earlier model has been replaced by a flat stainless steel plate of much heavier gauge which, together with the pressure plate at the top of the plate pack ensures more effective clamping of the filtering medium. The incorporation of the flat and heavier base plate permits shorter legs to the plated stand and also a higher plate pack for increased capacity.

With this arrangement, up to 36 plates can be accommodated, giving throughputs up to approximately 3,000 g.p.h. without the cover bowl becoming unduly long for convenient handling. The case clamping arrangement of the earlier model has been retained and it is only necessary to release six quick acting clamps for the removal of the cover bowl.

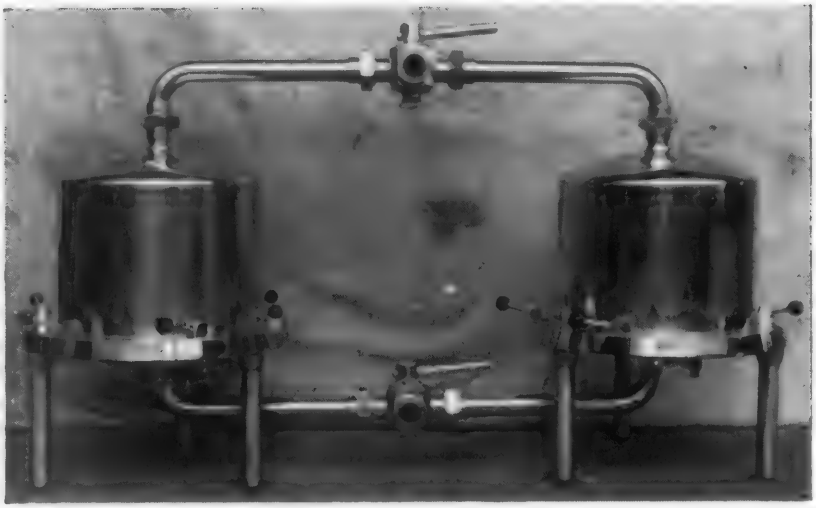
Appropriate inlets and outlets are provided and the filter, whilst normally operated with top inlet and bottom outlet, may be reversed if so desired.

The capacities for which these units are made range from 500 to 3,000 gallons per hour each and larger throughputs can be achieved depending upon the characteristics of the liquid to be filtered.

These filters are available either



The " Funda " dry residue filter, showing the two stages of operation: filtration (*left*) and discharge (*right*).



A twin-bowl filter unit for a 1,000 g.p.h. ice cream plant, made by C. P. Equipment, Ltd.

as single or duplex units, *i.e.* two or more bowls arranged with interconnecting pipe work and necessary cocks or valves in order to isolate and alternate for cleaning and normal maintenance purposes.

All stainless steel 3 in. diameter in-the-line strainers and filters are also produced by C. P. Equipment and are available with filter media similar to that supplied with bowl filters. Generally the capacity of these small units is around 250 g.p.h. and they can be supplied with interconnecting pipe work and cocks when required.

Dry residue discharge filter

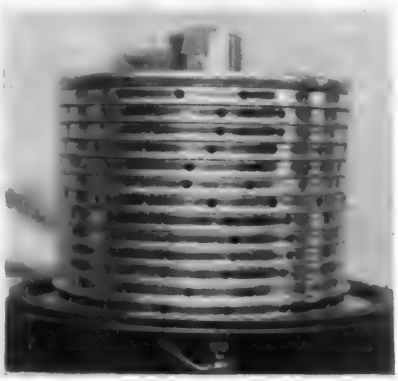
The *Funda* filter supplied by **Mason and Morton, Ltd.,** is a unit particularly suited to difficult materials, because the centrifugal cleaning with backflush rids the filter of even the stickiest cakes. The filter does not have to be opened up for cleaning for long periods, often months. It can therefore be sealed and special seals on the filter nest shaft ensure no leakage of vapour.

The principle is of filtration under pressure through a series of horizontal plates, mounted one above the other on a hollow shaft. The upper surface of the plates carries the filter medium; this is designed to ensure even build up and no risk of cake collapse.

The filtrate passes through into the hollow shaft and out of the filter. When cake thickness and density is such that filtration rate begins to drop off rapidly, the cycle is ended and the filter emptied (a special scavenger system ensures filtration to the last fraction of a gallon). The vessel is then filled with wash or solvent and the filter plate shaft spun at speeds sufficient to throw off the cake. Reverse flow wash, carried out simultaneously, complete this self-cleaning process.

Where the cake is to be recovered dry, the vessel is left empty when spinning, pneumatic ejection equipment then supplementing the centrifugal force.

All the usual filter aids can be used and filter medium can be wire cloth, Terylene, etc. In certain cases it can be used to filter awkward materials where only a very thin layer can be built up and where perhaps no filter aid is to be used.



This photo shows the plate assembly of a C. P. Equipment bowl filter.

Filter for edible oils

The *Sparkler* filter made by **L. A. Mitchell, Ltd.,** is especially suitable for the filtration of lard and vegetable oils because of the enclosed design and synthetic filter cloths which do not retain rancid oils during laundering. It is a horizontal plate filter, all wettable parts being of stainless steel. The discs are covered with synthetic rot-proof cloth, the cloth covers being sealed on the discs with clips removable by hand. Filter aid and filter paper can also be used.

The model V-type filter is also suitable for filtering sugar syrups in the confectionery industry.

Clarity Problems

(*Concluded from page 335*)

peratures involved, although the nature and amount of solids being arrested can be troublesome and can cause short cycles.

7. Edible oils

These, such as olive oil, vary in requirements from processing to the finished product and require a high finish. Decolorising can also be carried out during the filtration cycles.

8. Gelatines

These vary greatly, depending on the type and the degree of finish required. The low percentage liquids usually present more of a problem.

Contributions and Correspondence

The Editor welcomes practical contributions on all aspects of food manufacture, including the production and testing of raw materials. Articles should be illustrated with photographs and diagrams, as far as possible.

Letters on any subjects covered by *Food Manufacture* are also invited.

NEW DEVELOPMENTS in QUICK-FREEZING

By Graham Kemp*

Quick-freezing is the most efficient form of food preservation and will remain so, says the author of this challenging article. But to keep on top the industry must

- *eradicate complacency*
- *tighten up on temperature control during distribution.*

IT is now more than ever clear that quick-freezing is the most efficient form of food preservation man has yet devised! This sounds like arrogance coming, as it does, from someone closely connected with the industry, but the record of the past 15 years shows that frozen food has caught the public imagination in a manner that is altogether remarkable.

Few industries can boast so much progress over so short a period. In 1946 less than £150,000 was spent on the small quantity of frozen food produced in this country; yet only a decade and a half later the retail business is worth £46,000,000 and sales to caterers bring another £7,000,000. By any standard an astonishing achievement.

Growth of Quick-Freezing

- ★ *In 1946 consumer expenditure was less than £150,000.*
- ★ *In 1961 it is running at £53 million.*
- ★ *TARGET for 1964 is £100 million.*

(*Above*): **This new Birds Eye cold store in Lowestoft is one of the biggest in Europe and was opened in October last year.**

Complacency is a danger

But there are problems facing the industry to-day, not the least of which are complacency and the feeling that "now we've arrived, let's pitch our tents and sleep." The public at large, not to mention the trader, tend to take the frozen food cabinet for granted, and in the meantime new and untried methods steal the headlines in the trade and national press.

What is it that sets quick-freezing apart from other preservation methods and why do we

* Birds Eye Foods, Ltd.

look forward so confidently to that target of £100,000,000 retail by 1964?

To answer this thoroughly we must first of all take a new look at the process itself and then at some of the changes it has evoked in traditional methods of food distribution.

In basic essentials, the process has changed very little since the introduction of the plate froster. Refinements in design have given improved speed and performance, but what happens between the refrigerant plates when they compress hydraulically around the packets has not changed at all significantly since 1945.

All that has happened, in fact, is that we know rather more about the chemical and physical behaviour of food under extreme low temperature conditions than we did at the outset. Not all foodstuffs react in the same way on passing through what used to be known as the "zone of maximum crystal formation," but if one certainty has arisen from a mass of new evidence it is that zero degrees Fahrenheit is the absolute top limit for quick-frozen food which is to be kept for any length of time.

Temperature fluctuation is the enemy

There can be no common physical behaviour between products as diverse as peas, herrings, *Dairy Mousse*, beefburgers, sponge cakes and *Dinners-for-One*; but the lower the temperature at which they are stored the more remote becomes the possibility of enzymatic action and loss of flavour. It has been suggested recently that the lack of flavour which is said to be peculiar to American food is not the result of quick-freezing but of fluctuating temperatures during distribution and storage.

We are by no means guiltless in this respect in Britain, but the fact that frozen food distribution is largely in the hands of manufacturers has given us greater control over product temperatures from factory cold store to point-of-sale. Where, as in U.S.A., products on their way to the supermarkets pass through the hands of brokers and distributors it is obviously less easy to exercise such influence.

Inadequate standards in the American industry have not passed unnoticed, however, and efforts are now being made through the Association of Food and Drug Officials (A.F.D.O.U.S.) to implement a binding Code of Practice on everyone engaged in the industry—producers, distributors and retailers. The fact that this had to be done at all was no compliment to the frozen food business there and subsequent discussion about the measures proposed aroused much unfortunate comment in newspapers and magazines.

New code of practice

This can be avoided in Britain if voluntary action is taken soon enough, and we must therefore welcome the new Code of Practice issued by the National Association of Frozen Food Producers. It is undesirable that this document should be imposed upon the industry in any way, but if we cannot get 100% voluntary co-operation it would be equally undesirable not to take action.

THE DISTRIBUTION CHAIN

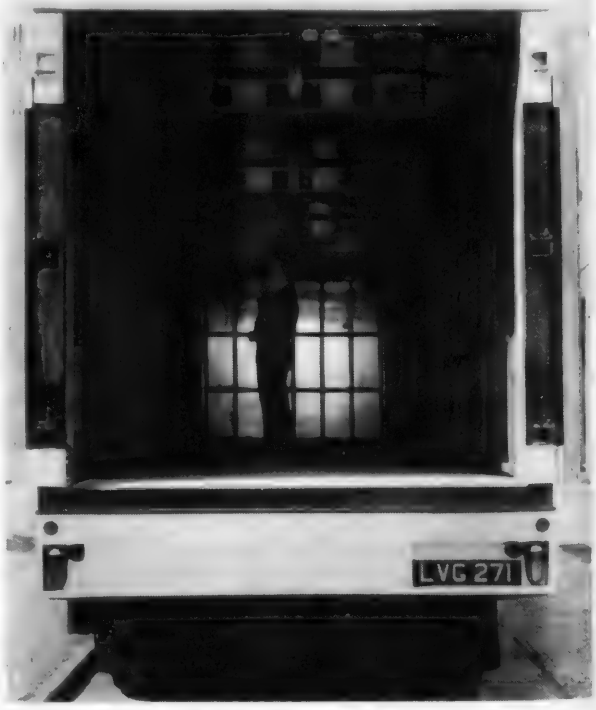
What are the main links in the chain of refrigeration from factory cold store to shopkeepers' cabinet and what progress have we made in improving methods and materials?

Cold store design

Factory cold stores are, of course, getting bigger and bigger and major advances have been made in the direction of mechanical handling. Pallet loading is taken for granted in all but the smallest of bulk stores and the use of fork lift trucks to move cased product from store to loading bay is now an integral part of modern cold store practice.

The need for rapid movement of stock in this way has itself dictated changes in cold store design, the most striking of which is the single span chamber in which there are few internal pillars to impede fork lift operation. Birds Eye have built a number of these stores at their factories, one of which—at Lowestoft—is among the biggest in Europe.

The latest stacking trucks require only an 8 ft. 6 in. gangway.



In long-distance haulage vehicles frozen foods are kept at the proper temperature by adequate insulation and by solid CO_2 in bunkers.

A complete train of 40 Birds Eye insulated containers leaving Great Yarmouth.

Every new cold store introduces a new method or material and it is undoubtedly because of the rapid growth of the quick-freezing industry that so much has been achieved in cold store practice during the past fifteen years. It is impossible to say exactly how much sub-zero space is available in Britain to-day, but the bulk of it is probably in private hands, owned and administered by frozen food processors and distributors.

New developments

In this field, the most important development of the past two or three years has been the introduction of new insulation materials. The traditional insulating medium for cold store construction has always been slab cork, but a number of new materials have become available recently and, even to-day, much research is going on to produce greater efficiency and lower costs in this essential part of cold store construction.

Techniques in vapour sealing have been very much improved in recent years, but the perfect vapour seal is still an ideal rather than a reality. It is advisable, therefore, not to apply vapour sealing to the inner surface of insulation, although it is vital that an efficient vapour seal is applied to the outer surface.

When planning a cold store which is to be cooled by air circulation, or by any other method, for that matter, it is important to make provision for the cold air to circulate above, between and below the stacks of frozen food cases. This is easy enough to effect in large cold stores where palletisation is employed, but it is equally important in small cold stores where the products are broken up for distribution to the retailer.

Most factory cold stores operate at temperatures of $-5°F.$ or $-20°F.$, and in order to maintain product quality during subsequent distribution it is vital that vehicle temperatures should be kept below $0°F.$ Ideally, all frozen food transport should be equipped with self-powered refrigeration units or eutectic hold-over plates and at the very least they should be adequately insulated and cooled by the application of solid CO_2.

Economically, some manufacturers have found that dry ice is less expensive than refrigeration for long distance haulage between factories and depots and because the doors are opened only once (when the products are unloaded at the depot), the temperature can be held below zero degrees Fahrenheit for quite long periods.

Refrigeration for shop delivery

Delivery from the depot to the retailer presents an entirely different problem, for vehicles on this sort of work can be unloading with the doors open up to 60 times a day. Here, dry ice would certainly be more expensive than refrigeration, and it needs to be applied and renewed very strictly if a constant internal temperature is to be held.

Observation suggests that most distributors have adopted refrigeration for shop delivery work, although there are still too many vehicles about in which there is not only no refrigeration but no dry ice either. One or two people get by without insulation, but they cannot be taken seriously as frozen food distributors.

Because standards vary so tre-

mendously between one firm and another—and sometimes even within the same organisation—retailers would be wise to heed the advice of the N.A.F.F.P. Code of Practice which suggests that deliveries should be rejected if the products are not in a correctly frozen condition. Just how serious this problem could be for the trade was demonstrated at an American industry convention last year when complaints were heard of products arriving at the shops at + 30°F. and higher.

Frozen food has a limited life at this temperature, and even if the product were to be "frozen down" again in the retailers' cabinet sufficient chemical change would have taken place to damage its quality and flavour. The biggest danger in the world of frozen foods is not so much temperatures above 0°F. but temperatures which go up and down as stock is moved from one place to another.

Cabinet design lags

There is another link in this chain which is too often overlooked in discussions about temperature control. Retailers' frozen food cabinets are produced nowadays by refrigeration firms of all shapes and sizes and with widely varying backgrounds. Some cabinets are well designed, both visually and mechanically; others are little more than ice cream cabinets with the lids off and are sometimes mechanically inadequate.

In future, refrigeration equipment for the retail trade will have to be designed to keep pace with the rapid development of the frozen food business. It is really absurd for any retailer to think of installing a cabinet of less than 12 cu. ft. capacity and, before he buys one, he ought to make quite sure that it maintains a temperature of 0°F., right up to the load line.

The British Standards Institute issued a standard for frozen food cabinets in 1958 (BS. 3053: 1958) to which all refrigeration manufacturers have been asked to adhere. Efforts are being made to make the retail frozen food stockist more aware of his responsibility in temperature maintenance and wherever possible he is being advised to ask for cabinets which accept this standard.

In large bulk cold stores the movement of quick-frozen foods is carried out by fork lift trucks.

Technical Books

It is now five years since the retail book department of Leonard Hill Ltd. was opened.

Many readers have written to us during this period, and many have shown their pleasure in the fast service we always endeavour to give by sending many further orders.

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Domestic Food Consumption and Expenditure, 1959

THE tenth Annual Report of the National Food Survey Committee* describes the diets of the average household in U.K. and in each region and type of area, and the diets of households of different income levels and of different family composition. One of the trends examined is the rising demand for "convenience" foods (labour-saving, prepared or semi-prepared products), expenditure on which accounted for nearly a fifth of total household food expenditure in 1959. A rise of 4% in the real value of food purchases between 1955 and 1959 is almost entirely attributable to increased expenditure on such foods.

The Report includes the results of three special studies. The first, which examines the effect of the housewife's age on the household diet, shows that food expenditure per head rose fairly sharply as the age of the housewife increased from 20 to 40, but thereafter declined with increasing age; the younger women also spent more on "convenience foods" than the older housewives. The diets of selected groups of old age pensioner households are also discussed. Thirdly, in Appendix E of the Report, various factors influencing the consumption of fish are examined, including the effect of proximity to ports and markets. Since 1953 the average consumption of all types of fish has remained fairly constant at about 6 oz. per person per week, but there have been some interesting changes in the demand for certain varieties, notably the decline in fresh herrings and kippers. Quick-frozen fillets and fish fingers accounted for 10% of domestic purchases of fresh white fish in 1959. For many individual foods the estimated price elasticities of demand, which were published in the Annual Report for 1958, have been recomputed from more recent data and these results are given in another Appendix.

* *Domestic Food Consumption and Expenditure, 1959.* H.M.S.O., London, 1961. Price 8s. 6d. net.

ADVANCES in FOOD TECHNOLOGY

IRRADIATION

Preservation of milk and milk products

An apparatus was constructed that allows the production of sterile concentrated (3:1) milk that is essentially free of off-flavour. Polyphosphate-treated milk processed in this manner may be stored at 30°C. in sterile form without gelation for at least 6 months.

It is possible that the apparatus may find practical use in the electron irradiation of other liquids of suitable viscosity. Saravacos *et al.*, *Food Technology*, 1961, **15**, 230.

High velocity electron irradiation of tomato paste

The effect of high-velocity electron (HVe) irradiation on ascorbic acid content, colour, aroma, and amperometric titration values of tomato paste was investigated. Ascorbic acid retention was 76% at $\times 10^6$ rads, and 68% at 2×10^6 rads. Under the conditions of this experiment, HVe irradiation caused no significant changes in *p*H, acidity, or colour of the paste. The aroma of the irradiated product became less acceptable as the irradiation dose increased. The sample irradiated at 100,000 rads was slightly inferior in aroma to that of the control sample. The amperometric titration method was used to determine the effect of HVe irradiation on sulphydryl groups in the constituents of tomato paste. The titratable groups decreased as the irradiation dose increased. The amperometric titration values follow a trend similar to that of the aroma changes caused by HVe irradiation. The effect of irradiation on chemical and quality changes in tomato paste is discussed.—Villarreal *et al.*, *Food Technology*, 1961, **15**, 220.

PACKAGING

Aluminium foil as packaging material

Aluminiuum foil has a wide range of protective qualities; it can be given a superior sales design, and can be used for many different types of packages; it is therefore an ideal packaging material. For economic reasons, the aluminium is rolled into very thin foils but is then, to obtain the necessary mechanical strength, laminated to paper or plastics, using glue or wax as a bonding agent, or coated with polyethylene. Chemical resistance may be increased by special varnish coatings, chosen in accordance with specific requirements. Aluminimum foil is resistant to fat and grease, affords effective protection against light and radiation of different types and prevents deterioration of taste or smell, so that it is extremely well suited for food packaging. Thicker aluminium foil is now being used for the manufacture of stiff trays for ready-made foods, deep-frozen foods, pies, etc. which can be placed in the oven and are then ready to be served. Such "heat-and-eat" packages, launched in the U.S.A. some years ago, are now also being introduced in Sweden and will facilitate and increase the use of easily cooked industrially prepared foods. The visual attraction of aluminium foil packagings is particularly desirable in self-service shops; this applies especially to the latest variety of gold-varnished aluminium foil.—Y. Hammenburg, *Skandinavisk Emballage— and Transport—Tidskrift*, 1961, **6**, 3.

BAKING

Effects of maltol, isomaltol and galactosylisomaltol on flavour of bread and pastry

A chemical method of preparing isomaltol developed recently, has permitted for the first time extensive investigation of this compound. Similarity of the odour of isomaltol to the fragrant, caramel-like odour of maltol prompted a flavour comparison of the two compounds in aqueous and bread-like media. Both compounds have been reported as minor constituents of bread.

Taste panel results show that maltol and isomaltol give similar caramel-like flavours, sometimes described as fruity. Isomaltol is generally described as sweeter, less bitter, weaker, and, at times, less pleasant than maltol. When each is incorporated in yeast rolls at 0·1% of the flour weight, flavour difference in the breads is frequently detected. The flavour is described as similar to that of the control fresh bread, only stronger. Isomaltol is the more volatile, and much of it is lost during baking.

The β-D-galactoside of isomaltol, easily prepared from milk sugar, has a bitter taste, In fermenting doughs, it is split into isomaltol and galactose and, in some baking pastries, by heat and moisture. Pie crust that contained 0·5% *O*-galactosylisomaltol before baking was preferred by tasters over the control.—Hodge and Moser, *Cereal Chem.*, 1961, **38**, 221.

CANNING

Temperature distribution during water cooling

It is desirable in cooling retorted canned foods to achieve a mass average temperature between 90 and 110°F. This prevents can rusting and thermophilic spoilage. A method is described for calculating the temperature distribution curve and mass average temperature after a given cooling time has elapsed. Calculated and experimental results agreed satisfactorily. Under certain circumstances, the proposed method appears simpler to apply than existing methods.—Charm, *Food Technology*, 1961, **15**, 248.

FREEZING

Specific heat determination at low temperature

A rapid method is described for continuous determination of the specific heat of foods over a wide range of temperatures below the freezing point. With this method, the specific heat of fats, gelatin, and water were measured. From these data, it is possible to estimate the specific heat of foods, based on their composition, using an appropriate correction factor. The possibility of vitreous ice formation is suggested to explain the discrepancies between the observed and computed specific heat values for meats and fish. —Moline *et al.*, *Food Technology*, 1961, **15**, 228.

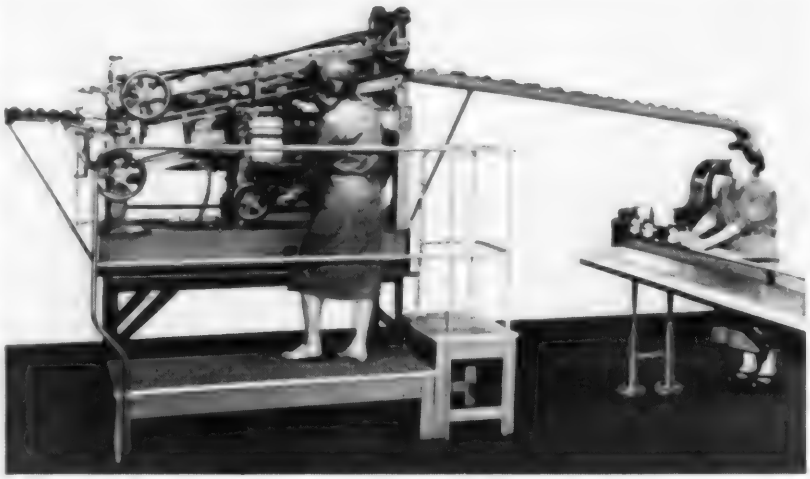
Thermal conductivity of meats, fats, gelatin, gels and ice

The thermal conductivities of ice, gelatin gels of several concentrations, different kinds of meat (including fish and poultry), and several kinds of fat, measured over a range of temperatures between 5°C. and −25°C., are presented. At above-freezing temperatures the conductivities of the different meats were about equal to each other and slightly lower than the value for water. A simple linear equation expressed the relation between temperature and conductivity for the gels and meats at temperatures below −10°C. The conductivity of fats varied only slightly with temperature. Comparison of measured and calculated results indicated that calculations would be of limited usefulness in predicting the thermal conductivity of frozen or other non-homogeneous food in practice.—Lentz, *Food Technology*, 1961, **15**, 243.

MACHINERY and EQUIPMENT

GLASS JAR LABELLER

A straight-through can labeller can be used for the labelling of glass jars. In order to make this can labeller suitable for labelling glass jars only one modification has to be made. A special and independently adjustable flexible guide has to be fitted in place of the fixed guide rail normally employed when handling cans. This modification is necessary in order to deal with the problem arising from the fact that labels on glass jars do not vary proportionately in height, with differences in jar sizes, as in the case of cans. This labelling machine can also be supplied to handle aerosols and other cylindrical containers in a varying range of sizes. Makers are the Purdy Machinery Co., Ltd.



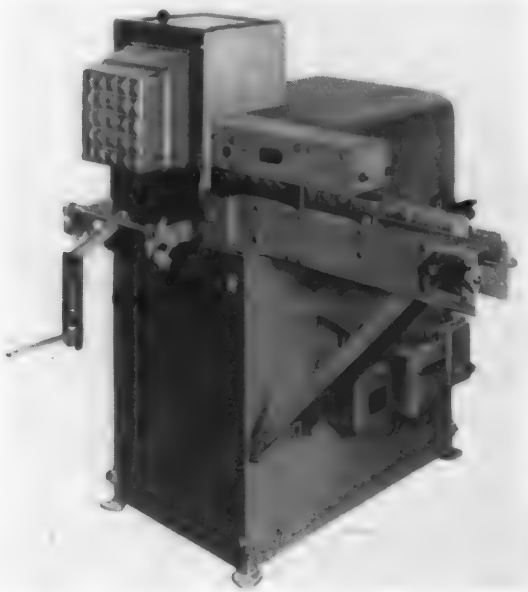
This Purdy can labeller has been installed at the Greenford factory of J. Lyons and Co., Ltd., for the labelling of glass jars.

POLYTHENE PEDAL BIN

A pedal bin moulded from heavy gauge polythene in red, blue or white, measures 18 in. by 12 in. at the mouth by 24 in. deep, and is of 15 gal. capacity. It tapers slightly for ease of fitment into and removal from the framework, which is designed to tilt it forward when the lid is lifted. The lid, which is also in polythene, is easily removed from the lifting mechanism when required, but remains firmly in place under normal conditions. It lifts positively when the pedal is depressed and falls back into place on removal of pressure. The framework is entirely of steel, the working parts are steel electro-plated, and the base is fitted with rubber feet with two wheels at the front. Advantages of the bin are that it sits square against the wall, is of a convenient height, is light, yet almost indestructible, resistant to corrosion, staining and most corrosive materials, and is extremely easy to clean. Makers are W.C.B. Containers, Ltd.

DOUGH MOULDER

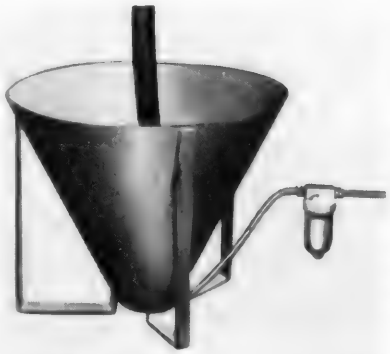
The *Universal* dough moulder can now be fitted with self-aligning prepacked bearings, which means that these machines are now greased for life, making a considerable saving in labour and maintenance costs. The chance of human error is also eliminated because with this permanent system of greasing there is no risk of the machine being insufficiently lubricated, which could result in breakdowns, expensive repairs and production hold-ups. The danger of overgreasing, too, is eliminated, thus preventing any possibility of oil or grease leakage contaminating the dough. Details on application.



Packages entering this caser via the in-feed conveyor are marshalled into the magazine by means of an accelerating unit whence they are formed into the required arrangement, ready for ejection into the case.

PACKET AND CARTON CASER

A simple piece of equipment, consisting of a main unit to which can be fitted any variant in the form of change parts, in themselves simple, inexpensive and positive in setting and operation, has been developed to case cartons, giving an almost limitless range, from a $\frac{1}{2}$ in. square meat cube to a breakfast cereal package. Time required for changing parts is approximately 7 minutes. It is capable of handling any type of package so long as it has a positive shape, and it will pack them into fibreboard and corrugated cases, and even into multi-wall paper or plastic bags if required. Details on application.



This feed unit prevents entry of metallic particles which would damage extrusion processing systems.

FEED UNIT

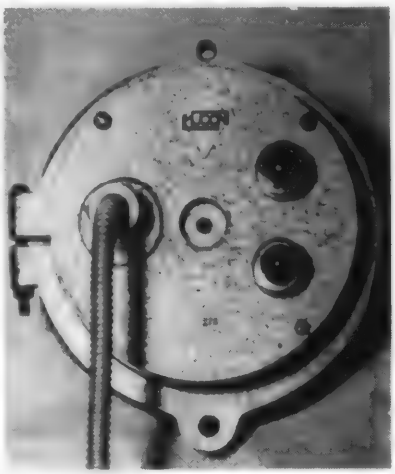
A hopper which can be placed on the floor or any convenient point for accepting raw material from the bulk source, and a large bore flexible pipe which is fed into the machine hopper, which will normally be some height from the ground, and is usually on top of the machine it serves, has been developed. Operation is by compressed air working at a pressure of 60 lb. per sq. in. It will raise to a minimum of 20 lb. from floor level to an elevation of 7 ft., capacity increasing with the air speed. One advantage gained by use of this feed unit is that it prevents ingress of metallic particles that would be large enough to do damage to extrusion or similar type processing systems. Details on application.

PLASTIC LINING

Polytile type *B1* has been designed to give a clean, hygienic, washable lining with good resistance to water, chemicals and solvents, and high resistance to abrasion. It is easily applied by brush, roller or spray gun to the interior surfaces of silos, bins, hoppers, and the like, made of steel, concrete, wood and other normal constructional materials, and in addition to extremely good abrasion resistance, trials over a wide field during the past two or three years have shown *Polytile* type *B1* to have remarkable release properties. *Polytile* type *B1* is applied by simple methods over surfaces prepared in the ordinary way, and hardens off at ordinary temperatures. Details on application.

HOPPER LEVEL SWITCH

An automatic hopper level control switch for solids and slurries has been introduced which is particularly suitable for light powders and products of low bulk density. The switch comprises an aluminium alloy body measuring 5 in. in diameter and 2¾ in. in depth. It has a separate fixing clamp and two compartments separated by a stout partition, which protects the diaphragm against over-loading, and prevents the contents of the hopper entering the electrical compartment in the event of diaphragm failure. The replaceable steel or plastics sheet diaphragm can be supplied with various coverings when necessary. Sensitivity can be externally adjusted, and deflection of the diaphragm is directly transmitted to a micro-switch. Plug or conduit entry can be provided, and the switch may be connected for local indication, remote signal, motor control switching, bin stock control, etc. Makers are Mucon Engineering Co., Ltd.



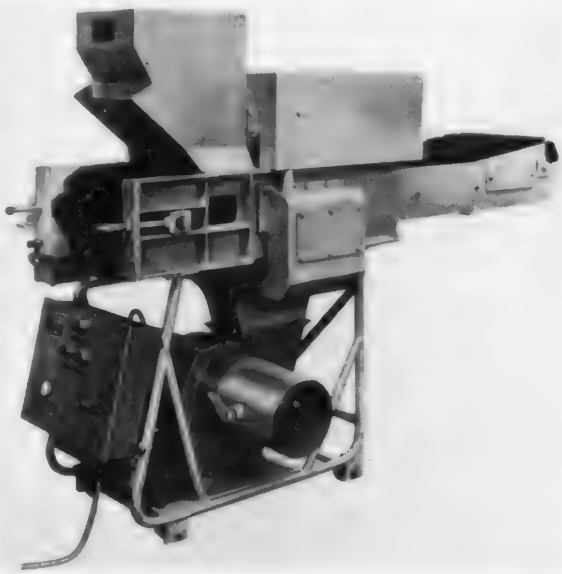
This hopper level switch, manufactured by the Mucon Engineering Co., Ltd., is easy to install, requiring only a 5 in. diameter hole in the hopper wall, the fixing clamp, sealing ring and two bolts.

CHAIN GRATE STOKER

A stoker has been developed to burn small low grade slack coal, and is suitable for installation in sectional boilers rated at 1,000,000 B.T.U./hr. or more used for central heating. The complete unit is mounted on a frame with wheel base, so that it can be wheeled into and attached easily to the boiler. Interlocked grate links of heat resisting cast iron form an endless belt, and give uniform air distribution across the full width of the grate, which is driven from a front driving shaft carrying sprockets which engage in slots formed on the underside of the links. At the rear end the grate rides over a plain idler cylinder revolving on a stationery shaft. The driving mechanism comprises a ⅛th h.p. geared motor unit driving into another gear train, and is carried at one end of the stoker front shaft. A spring loaded dog clutch operating on a splined shaft affords mechanical protection of the gearing end motor. Provision is made for tensioning the grate. Details on application.

HEAT SEALING PRESS

A pneumatic heat sealing press has been designed exclusively for the heat sealing of *B2C* type *Bubblepaks* (bubbles to cards). Although intended for use with a compressed air supply, in the absence of such a supply a suitable ½ h.p. compressor capable of 120 p.s.i. with pressure reducing valve can also be purchased. The timing dwell is operated by lowering the handguard, which ensures complete operator safety, the platen lifting automatically after completion of pre-set time dwell. The machine may be obtained from the Packaging Division of Gordon and Gotch (Sellotape), Ltd.



This stoker has been developed to burn small low grade slack coal and is suitable for installation in sectional boilers rated at 1,000,000 B.T.U./hr. or more.

PACKAGING

Frozen muffin containers

Frozen muffins, in a six-muffin aluminium container are being marketed in the New York, Philadelphia, and New England areas by Downyflake Foods Inc. The container, specially made by Kaiser Aluminum and Chemical Sales, Inc., represents the solution to the difficult problem of drawing and forming multiple-cavity containers from a single sheet of 0·003 in. gauge aluminium foil. Outside dimensions of the container are 9 in. × 6 in., and in spite of the forming required, it is sturdy and durable. Batter for the muffins is deposited automatically in the container which passes through a closing machine where it is automatically fitted with a plug board lid, sealed in place by machine crimping the special hemmed edge of the container. Rapid and efficient production is provided by the closing machine, dealing with 50 containers per minute.

Downyflake Foods Inc. uses a six-muffin container to market blueberry, honey-nut, corn and raisin-bran muffins. The muffins are shown in the container before and after baking.

Reed manufacture Netapak carton

A new waxed carton to be known as Netapak is being manufactured by Reed Cartons, Ltd. The carton is used for containing milk and soft drinks, and has considerable potential in the automatic vending field. Commenting on this venture, a director of the company said: "The automatic vending and general retailing of liquid foods and soft drinks in waxed cartons has been, and will continue to be, an area of innovation and great expansion."

This attractively printed red and black counter display unit is manufactured by Reed Corrugated Cases, Ltd.

Pick-up and try pack

At present in use in ironmongers and other stores throughout the country for the retail marketing of Skyline jar cap wrenches is a Reedac counter display unit which makes full use of the popular "pick-up and try" appeal to shoppers.

The unit is finished with an outer surface of white kraft and printed with a design in red and black. The functional design of the pack was arrived at jointly by the Prestige Co., Ltd., who manufacture the wrenches, and Reed Corrugated Cases, Ltd.

Lightweight cream container

A 4 fluid oz. plastic bottle for frozen Devonshire dairy cream will be marketed by Youngs, Ltd. This new polystyrene container, designed and produced by Pioneer Plastic Containers, Ltd., is tough and light to carry. The cream will keep perfectly fresh in the refrigerator in this container, and once the cream has been finished, can be thrown away. The container is ideal for all kinds of travelling or occasions where weight and breakage factors are important.

With a practical "spoon-sized" neck, the container is produced in an attractive cream colour with blue printing, and has an easy-to-open foil cap.

NEWS DIGEST

B.F.M.I.R.A. Annual General Meeting

The fifteenth annual general meeting of the B.F.M.I.R.A. was held at the Park Lane Hotel, London, W.1, on Thursday, June 29. After adoption of the accounts for the year ended December 31, 1960, and approval of the Reports of the Council and the Director of Research, the seventy representatives of member firms who attended the meeting elected officers and members of Council for the ensuing year. Professor A. C. Frazer, M.D., D.SC., F.R.C.P., was re-elected President, and Lt.-Col. G. R. Harding, D.S.O., M.B.E., and The Lord Tweedsmuir, O.B.E., were re-elected Vice-Presidents.

Eleven members of Council, retiring in rotation, were re-elected. Mr. A. J. Lewellyn (Associated Fisheries, Ltd.), and Dr. H. Jasperson (J. Bibby and Sons, Ltd.), were elected to fill vacancies on the Council arising from the retirement during the year of Mr. A. Glover (Co-operative Wholesale Society, Ltd.), and Mr. R. P. Wollard (London Oil Corporation, Ltd.).

At a Council Meeting later in the day Mr. C. O. Barber (Batchelors Foods, Ltd.) retired from the Chairmanship on the conclusion of three years' service in that capacity, and Mr. G. B. Stancliffe (W. S. Shuttleworth and Co., Ltd.) was elected Chairman. Mr. C. P. B. Shippam was elected Deputy Chairman.

The luncheon following the a.g.m. was attended by some 240 members and guests. The Director of Research and 20 members of the Leatherhead staff were present.

After the Loyal Toast, the President, Professor A. C. Frazer, welcomed the guests and proposed their health. The principal guest, Sir Harry Melville, K.C.B., F.R.S., Secretary of the D.S.I.R., replied. He expressed his gratification that the four food Research Associations had elected to remain under the D.S.I.R. umbrella and not transfer to the ægis of the Agricultural Research Council, a possibility which had been put forward when the D.S.I.R. had transferred its food interests (other than fish) to the A.R.C. Referring to the creation of the British Industrial Biological Research Association as an important development in food technology, Sir Harry expressed the hope that co-operation between B.F.M.I.R.A. and B.I.B.R.A. would be extremely close. The fact that Professor Frazer was already President of both Associations was a great step in this direction.

Examining the portrait of Sir Frederick Gowland Hopkins are (*left to right*) Dr. F. E. G. Hopkins, a son; Dr. B. Holmes, a daughter; Mrs. J. B. Priestley, another daughter; and Mr. A. J. C. Hoskyns-Abrahall, chairman of Van den Berghs and Jurgens, Ltd.

Vitamin discoverer honoured

Commemorating the centenary of the birth of Sir Frederick Gowland Hopkins, the discoverer of vitamins, a memoir has been written by his close friend and former colleague, Prof. Ernest Baldwin, and has been published by Van den Berghs, Ltd.

During the first world war, margarine was cheap and plentiful, but even the manufacturers doubted its nutritional value. Hopkins carried out research on the vitaminisation of margarine, and this project reached a successful conclusion in 1927 when the first fully vitaminised margarine appeared in the shops.

A plaque has been erected to him by Van den Berghs and Jurgens, Ltd., and was unveiled by his daughter, Dr. Barbara Holmes. Others present at the unveiling included Dr. F. E. G. Hopkins, his son, Mrs. J. B. Priestley, his daughter, Mr. J. B. Priestley, Dr. J. Needham, a former colleague, and Mr. A. J. C. Hoskyns-Abrahall, chairman of Van den Berghs.

New Baker Perkins sales arrangements

New appointments and sales arrangements are announced by the Baker Perkins group of companies covering their interests in wrapping and packaging through the Forgrove Machinery Co., Ltd., and Rose Brothers (Gainsborough), Ltd.

A joint sales organisation operating from July 10 will sell Forgrove and Rose machines directly to all industries in the U.K. and Eire other than the bakery, biscuit and chocolate and confectionery industries.

The sales manager of the new organisation is Mr. R. G. Radley, sales director of Rose Brothers. Mr. R. C. Wenban, who has just been appointed commercial manager of Forgrove, will be deputy sales manager. Mr. R. G. Smith has been appointed assistant manager, commercial office, of Forgrove.

The new sales arrangement is complementary to that announced on June 1, whereby Baker Perkins, Ltd., will sell both Forgrove and Rose Brothers machinery to the bakery, biscuit and chocolate and confectionery industries.

Soft drink production for 1960—correction

The M.A.F.F. figures for soft drink production in 1960 published on p. 307 of last month's issue were, of course, in thousand gallons, not gallons as was inadvertently stated.

This insulated van for Times Food Products carries seven tons of quick frozen foods at a temperature of 0 F. The refrigerant is solid CO_2 contained in aluminium bunkers mounted on the underside of the roof.

Milk and Milk Products Committee report

The 1960 Report of the Milk and Milk Products Technical Advisory Committee, which was appointed in 1955, has been presented to the Minister of Agriculture, Fisheries and Food, and to the Secretary of State for Scotland, has been recently issued.

The committee have continued to keep under review technical problems facing the dairy industry. Among the subjects under consideration are the incidence of antibiotics, particularly penicillin, in milk, and the problems associated with slow-ripening and weak-bodied cheese.

A bulletin for commercial users and manufacturers of milk powder, prepared by the committee, has been presented to the Ministers along with the Report. Arrangements are being made for its publication. A further announcement will be made when it is published.

Copies of the report may be obtained from the Joint Secretaries, Milk and Milk Products Technical Advisory Committee, Ministry of Agriculture, Fisheries and Food, Great Westminster House, Horseferry Road, London, S.W.1.

Dr. Banfield to join Shippam's board

Dr. F. H. Banfield, M.SC., PH.D., F.R.I.C., F.R.S.H. M.I.BIOL., Director of Research of B.F.M.I.R.A. since 1951, is resigning and has accepted a directorship with C. Shippam, Ltd. He joined the staff of the Research Association in 1926.

Silicones as desiccants for powders

Work carried out on the treatment of various powdery materials with silicones suggests that such materials can be made less susceptible to moisture. Properly treated dry powders retain their free-flowing characteristics, and do not cake on long time storage, while dusting tendencies are reduced. Among the materials so far treated are salt and sugar. The method of treatment has been to mix the powder thoroughly with a solution of silicone compound in a suitable solvent, followed by drying and, in some cases, a short heat cure. The effective concentration needs to be determined experimentally for each powder, but generally 0.5-5% is effective.

Crofts (Engineers)—new office

On June 26 the London Office of Crofts (Engineers), Ltd., moved from 34, Norfolk Street, Strand, London, W.C.2, to new premises at 36/42, Tanner Street, Bermondsey, London, S.E.1 (tel.: HOP. 7751/4).

Fisons Foods, Ltd., formed

Since September, 1960, Fisons, Ltd., have controlled the firm of Pickering's Produce Canners, Ltd., Glossop, Derbyshire.

Fisons have recently formed a new company, Fisons Foods, Ltd., to control their food division. The sales and marketing headquarters of Fisons Foods, Ltd., is at Loughborough, Leicestershire, and for purpose of administrative convenience the office staff of Pickering's Produce Canners, Ltd., have been moved from Glossop to Loughborough.

The name of Pickering's will continue to be used on canned foods produced at the Glossop cannery.

Escoffier, Ltd.

Escoffier, Ltd., are combining their interests with their U.S.A. agents, Heublein, Inc., of Hartford, Conn. The present management will continue with Mr. Arthur J. Goodbody as chairman, Mr. George E. Goodbody as factory director, and Mr. John Warwick Fenn as sales director. The American firm's interests will be represented by Mr. Edward G. Gerbic, who joins the board.

First International Congress – *further details*

Some further details of the programme of the 1st International Congress of Food Science and Technology are now available. The Congress is being held in the Imperial College of Science and Technology, London, from September 18 to 21, 1962, and the programme is divided into four sections, which will run concurrently through the four days of the Congress except for a number of periods devoted to plenary sessions and congress symposia.

The four sections are entitled: Chemical and Physical Aspects of Foods; Biological and Microbiological Aspects of Foods; Quality, Analysis and Composition of Foods; and Manufacture and Distribution of Foods. In addition, four congress lectures will be delivered, and three symposia will be held, on (1) education and training of food scientists and technologists, (2) changing national and international patterns of food consumptions, and (3) effects of modern agricultural practices on foods.

The subject to be covered in Section D—Manufacture and Distribution of Foods—are: dehydration; freezing; canning; pasteurisation and sterilisation; packaging; distribution; general problems in food factories (*e.g.* effluents, hygiene, instrumentation and control); agricultural processes; and manufacturing processes.

The Congress President is Lord Rank of Sutton Scotney, the chairman of the Executive Committee is Prof. H. D. Kay, C.B.E., F.R.S., and the hon. secretary is Francis J. Griffin, Esq., A.L.A., F.R.E.S., 14, Belgrave Square, London, S.W.1, from whom further details may be obtained.

Report on marking imported bacon rashers

The report of the Standing Committee which held an enquiry from May 2 to 4, 1960, into an application for an Order in Council to require imported bacon cut into slices or rashers to be marked with an indication of origin, has been published. It concludes that there are insufficient grounds for recommending such an Order in Council, and the Ministers concerned have accepted the report. Copies of the report (cmnd. 1385) may be obtained from H.M.S.O. or any bookseller, price 1s.

Irish Sugar Company—correction

We regret that on page 275 of last month's issue in the second paragraph of an article on the Irish Sugar Company's new A.F.D. plant at Mallow, Eire, reference was made to the "British Sugar Company." This was a printer's error and should of course have read "Irish Sugar Company."

F.M.F. annual luncheon

At the Annual Luncheon of the Food Manufacturers' Federation held in June, the president, Mr. J. P. Van den Bergh, after welcoming the Minister of Agriculture, Fisheries and Food, and thanking him for giving up so much of his time to the Federation, announced his own retirement at the end of the year. In his speech to the guests, he expressed the hope that a Food Industries Council, which had failed previously, should be again developed. The president also referred to the Common Market and the need for greater international work. The Rt. Hon. Christopher Soames, Minister of Agriculture, Fisheries and Food, replied on behalf of the guests.

Speaking at the annual luncheon of the Food Manufacturers Federation is Mr. J. P. Van den Bergh, president. Seen with him are (*left*) Mr. Christopher Soames and (*right*) Sir Leslie Robinson

New spice developments

New developments in flavour control are announced by Spicemanns, Ltd., Scottish spice millers, who have introduced new methods of refining and grading aimed at accurately controlling flavour, stability, colour, strength and texture of food ingredients.

Two ranges of spices and seasonings are available under the trade names *Spicemax* and *Solsea*. The former is based on salt, dextrose or yeastless rusk, and the latter is an emulsion. It is claimed that both products are completely free from harmful bacteria, mould spores and trace metals often found in spices.

In addition to these, special flavourings can be blended in infinite variety, manufacturers' own recipes can be made up under the strictest secrecy, or new flavours developed on behalf of customers with guaranteed exclusivity.

The firm say they guarantee dispatch within 48 hours and supply batched quantities at no extra cost. Their research division has amassed considerable information on flavour control, and their booklet, "Flavour Control. A New Development for the Food Industry," is available to manufacturers on request from Michael Lawler and Borradaile, Ltd., Royalty House, Dean Street, London, W.1.

Big increase in quick-frozen fish — says White Fish Authority

According to the White Fish Authority's annual report for 1960/61, issued on June 27, there was a rise of over 21% in British production of quick-frozen fish in the 1960/61 season, a significant proportion due to the larger quantities frozen by factory trawlers, of which three are now operating. The quantity frozen—52,417 tons—represented a fish usage of 116,500 tons, or 14·5% of total landings. Home market sales increased by 39%, a larger share being taken by imports which rose by 76% over the previous year.

After discussions with Government departments on the terms and conditions on which loans would be made for processing plants, it was agreed that finance would no longer be provided to larger firms who could borrow commercially on reasonable terms. The rate of interest charged is somewhat higher than for loans for vessels. Approvals of this class of loan totalled £120,828 in 1960/61.

British production of white fish meal declined to 71,400 tons in 1960, because of a drop in supplies of raw material. Imports, on the other hand, rose by about 15 per cent., most of the increase coming from Peru and South-West Africa.

Field-Marshal Viscount Montgomery watching the prepackaging of poultry into polythene bags at the produce prepackaging stand at the Bath and West Show.

Food Fair, 1962

The seventh Food Fair, organised by the Food Manufacturers' Federation, Inc., will be open to the public from August 30 to September 12, 1962, at Olympia, London.

The Fair will be open to members of the trade for two days before the public are admitted, *i.e.* on August 28 and 29.

The Federation has welcomed the generous sponsorship of the Fair by the *Daily Express* on the last four occasions. It has now been mutually and amicably agreed between them that the next Fair in 1962 should be organised free of sponsorship, although the *Daily Express*' continued goodwill and friendship is assured.

Preliminary details regarding Britain's Food Fair can be obtained from the General Organiser, 10, Mount Row, London, W.1. (tel. Hyde Park 2933).

Census of production 1958

Copies of the Report on the Census of Production for 1958, Part 8—Bread and Flour Confectionery—and Part 33—Vegetable and Animal Oils and Fats—are now available from H.M.S.O., price 2s. each (postage 2d. extra).

Profusion of additives alarms Peers

THE ingenuity of the manufacturers had far outrun the vigilance of the authorities who should protect the people's food, declared Lord Douglas of Barloch during a Lords debate on the use of chemicals in food.

He said that hundreds of chemicals were used in agriculture and in food processing as preservatives, colours, flavours, humectants, emulsifiers, stabilisers and as substitutes for natural foodstuffs. More and more synthetic chemicals were being devised for this purpose. Hardly a week passed without new applications for patents being filed.

Manufacturers, naturally, did not intend to poison people, but they themselves were unable to foresee all the consequences of what they did. Lord Douglas contended that not only was food injured by the processes and additives to which it was subjected, but in many cases it deteriorated through being kept for long periods. Milk supplied in large cities was often three or four days old when it reached the customer; really fresh eggs were now hardly obtainable because of the time taken in passing through the monopolistic system of the Egg Marketing Board.

He called on the Government to prohibit the use of any new chemical not hitherto in general use in the food industry. Manufacturers should be required to produce positive evidence of the safety of additives already in general use and if they failed to do so those additives should also be banned. A minimum requirement should be imposed on manufacturers to label all food so as to disclose the additives or processing to which it had been subjected. This was already the law in many countries.

The Government spokesman, Lord Hastings, described the extensive investigation and research being carried out into these problems. He said that while there were risks inevitably attached to these substances which were used because of the nature of the civilisation in which we lived, nevertheless those risks should not be exaggerated. In a comparatively short time the Government hoped and expected to get the whole subject under proper control so that the public could eat their meals in safety.

He mentioned that the Food Standards Committee were to undertake a comprehensive review of the Labelling of Food Order and of the labelling provisions of the Food and Drugs Act.

Weights and Measures Bill to be amended

The dropping, through lack of Parliamentary time this session, of the Weights and Measures Bill was announced in the Commons. It had passed through all its stages in the Lords.

Mr. Reginald Maudling, President of the Board of Trade, said it was intended to present in the near future a Weights and Measures (No. 2) Bill which would include amendments made to the first measure. Public discussion, he added, had brought out additional matters of interest to particular trades, consumers and local authorities, all of which had received careful consideration.

B.o.T. inquiry into milk dumping

It was stated that the Board of Trade were engaged in a full investigation of an application by the Milk Marketing Board for action under the anti-dumping legislation against full cream milk powder imported from France, Belgium and the Netherlands and on skim milk powder from France. Investigations had extended to Austria, Finland and the Irish Republic and might be extended to other countries which appeared to be supplying milk powder at dumped or subsidised prices. Representations had been invited from interested parties.

Bread price increases

Pointing out that there had been three price increases in bread in just over a year, Mr. Geoffrey de Freitas (Labour, Lincoln) asked whether there had been any corresponding increase in the quality or size of the loaf.

Mr. Christopher Soames, Agriculture, Fisheries and Food Minister, replied that there had been no change in the prescribed weight of the standard loaf. It would not be appropriate for him to give an opinion about quality as this was so much a matter of individual taste.

He told another M.P. that the price of home milled flour for bread making, which was mainly produced from imported wheats, was now about 16s. per ton more than at the same time last year.

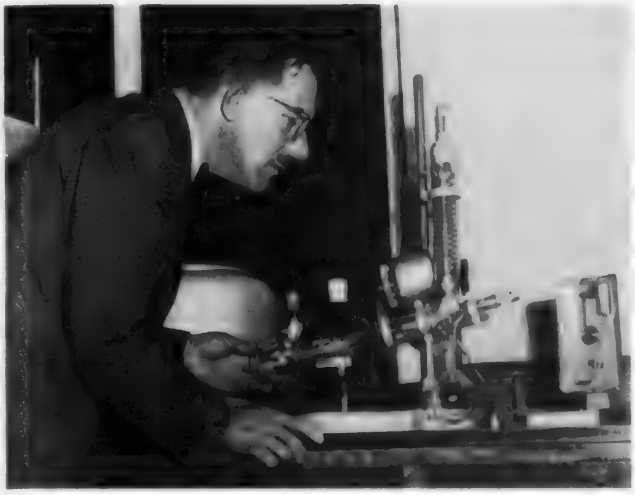
Committee idea disapproved

Turned down by the Minister was a plan put forward from the Conservative back benches for an inter-departmental committee to examine the need for "co-ordinating the food market, for limiting imports, by tariffs if necessary, and for operating effective anti-dumping measures."

Mr. Soames said he was not persuaded that the present conditions of the food market were such as to warrant a fundamental reappraisal of the agricultural support and trading policies on the lines suggested.

246 prosecutions

Mr. Soames informed the House that since the Food and Drugs Act, 1955, came into operation, proceedings relating to foodstuffs under Section 6 of the Act had been begun in 246 cases. Of these, 48 were withdrawn for various reasons. The prosecutions concerned a variety of foodstuffs and were related to misleading labels and advertisements.



Professor Hawthorn examines the Rotary Film Evaporator.

News from Scotland

New research laboratory

The new research laboratory of Rowallan Creamery, Ltd., in Glasgow, was opened by Professor J. Hawthorn of the Food Science Department of the Royal College of Science and Technology, Glasgow. Among the new equipment is an electronic balance, and a gas chromatograph, used in the analysis of fats and oils, which separates commercial fats into their constituent parts.

Course for fish workers

Aberdeen is to set up its first training school for young people entering the fish industry. The education committee agreed on June 23 to buy a fish processing plant for £7,500; other facilities, including a class-room, will be provided.

It is hoped that the first class of 30 trainees will begin next January. Mr. J. R. Clark, director of education, said that the idea behind the project was to attract a better type of person into this skilled trade and to achieve a more stable labour force.

The committee would run three classes a year. Jobs would be guaranteed for all who completed training. The students would get instruction in hygiene, first-aid, elementary marine biology, and refrigeration, in addition to the arts of filleting and smoking.

The course will be open to boys and girls between the ages of 15 and 17.

Flour mills to close

The J. Herdman and Sons, Ltd., Edinburgh flour mills, are to be closed down by Joseph Rank, Ltd., on September 2. Production will be concentrated at their Leith mills, including the Caledonia Mills.

Scots C.W.S. jam factory closes

The preserves factory of the Scottish C.W.S. in Leith has ceased production. About forty workers are affected. Jams have been made at the brick-built factory for about 40 years, and the decision to close down came as a "bombshell" to the employees when it was announced. The S.C.W.S. were loth to discuss the position, however. Officials at the factory referred inquiries to Glasgow headquarters of the Society. There, however, a spokesman said: "We have nothing to say at all."

The whole of the S.C.W.S. preserves has been concentrated in their factory at Shieldhall, Glasgow. It is understood that the Leith building will be used for other purposes by the Society.

Birds Eye expansion

Bird's Eye Foods, Ltd., are to extend their cold storage facilities at Glasgow, Edinburgh and Dundee to meet the steady expansion of demand in these areas for frozen foods. The Renfrew store, serving Glasgow, will be extended to take 10 times the previous volume, and Edinburgh six times. The Dundee store will be increased to three times the present volume.

★ *Packaging* ★

is the subject of a special supplement in next month's FOOD MANUFACTURE which will survey the latest packaging materials and methods and will contain commissioned articles by packaging experts on

- **New Developments in Labelling**
- **Colour in Packaging**
- **Packaging of A. F. D. Foods**

and other important aspects of packaging.

Technical Press Review

Containers for Dried Milk Powder . . .

are examined in the August issue of **Dairy Engineering,** which also comments on Distribution Problems of the City Retailer and of the Producer-Retailer.

Automation Progress reviews Computers in Refinery Technology and tells how Spectroscopy Aids Forging Plant.

Fuel Economy is featured in **Chemical and Process Engineering** and Glass is considered as a Material of Construction for Chemical Plant.

Display Ideas for Exhibition Stands are put forward in **Conferences and Exhibitions** and Charles Crawford gives his Nomination for an Ideal Conference Hotel.

A survey of Rubber Linings is included in **Corrosion Technology,** which also reports on Corrosion Research in the U.S.S.R.

Fibres and Plastics comments on the Structural Aspects of Bonding and on Moisture Permeability of Building Boards.

A special feature on Distillation is given in **Manufacturing Chemist** and an account of Research into the Common Cold Virus is included.

Flexographic Inks and Fluorescent Paints are two subjects dealt with in this month's issue of **Paint Manufacture.**

New Principles in Canadian Hydrofluoric Acid Alkylation Unit are explained and Problems in Transport and Storage are examined in **Petroleum.**

Conveyor Belt Moves Construction Material on a Suspension Bridge is an article appearing in **Public Works and Muck Shifter,** which also tells of Developments in Tunnelling Techniques.

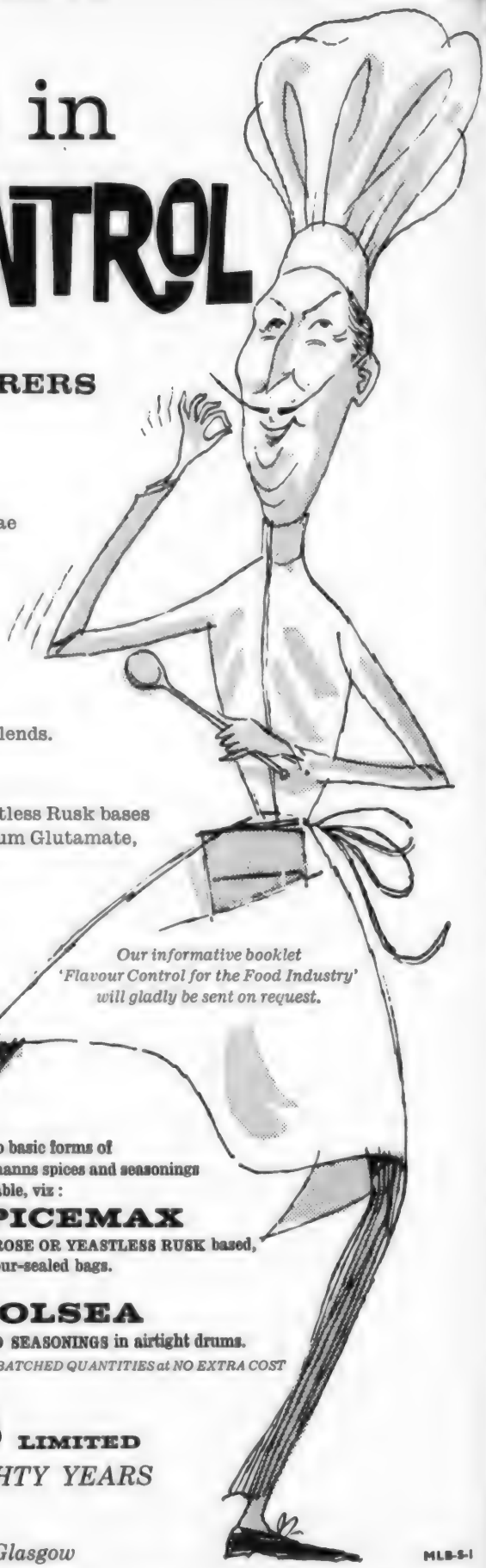
Coffee Pruning is studied and the Howard Trench Digger is reviewed in **World Crops.**

Specimen copies of these journals can be obtained by writing to the Circulation Manager, 9, Eden Street, London, N.W.1.

New ideas in

FLAVOUR CONTROL

A NEW SERVICE FOR FOOD MANUFACTURERS



Features of this service include:

1

Exact reproduction of any flavour from your own formulae under conditions of the strictest secrecy.

2

The development of new flavours with guaranteed exclusivity.

3

Standard flavours from a vast and subtle range of spice blends.

4

Spices and seasonings supplied on Salt, Dextrose or yeastless Rusk bases including, where required, ingredients such as Monosodium Glutamate, Milk Powder, Phosphates, and Sodium Metabisulphite.

5

Strict grading and control, within fine limits, of flavour, colour, stability and strength.

6

GUARANTEED DISPATCH WITHIN 48 HOURS

All these features are provided within your normal cost range:

they therefore will effect a considerable saving in time and cost on your own production lines.

Oleo-resins are extracted from spices under strictly hygienic conditions. Harmful bacteria and mould spores are eliminated, and the resultant concentrates actually combat bacterial activity.

Our informative booklet 'Flavour Control for the Food Industry' will gladly be sent on request.

Two basic forms of Spicemanns spices and seasonings are available, viz :

SPICEMAX

SALT, DEXTROSE OR YEASTLESS RUSK based, supplied in flavour-sealed bags.

SOLSEA

EMULSIFIED SPICES AND SEASONINGS in airtight drums.

Both types can be delivered IN NORMAL BATCHED QUANTITIES at NO EXTRA COST

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MILLERS OF FINE SPICES FOR OVER EIGHTY YEARS

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MLB-S-1

PEOPLE

MR. A. T. GREVATT, who has been 36 years with Mac Fisheries, Ltd., has been appointed quality control manager, a new position in the company, concerned with controlling quality of supplies from quay to consumer.

*

MR. A. SCHWARZ has retired as managing director of I.F.F. (Nederland), N.V. He has been succeeded by MR. F. H. P. TRIP.

*

MR. J. WEST has been appointed sales manager of Norie, Ltd.

*

Four managers have been appointed by the Buxted Chicken Co. They are: MR. N. W. SIMPSON, southern division; MR. R. B. WELLS, Aldershot factory; MR. B. C. MEATH, Aldershot senior production manager; and MR. J. C. WEALE, Boreham factory.

*

Following the death of Mr. C. Goldrei, MR. B. M. GOLDREI, former vice-chairman, has been appointed chairman of Ch. Goldrei, Foucard and Son, Ltd. MR. L. H. GOLDREI has been appointed managing director.

*

DR. R. J. L. ALLEN of Beecham Foods, Ltd., has been re-elected Hon. Sec. of the Nutrition Society and DR. W. F. J. CUTHBERTSON, Hon. Treasurer.

*

MR. C. J. ROBERTSON has been elected Chairman of James Robertson and Sons (P.M.), Ltd., jam and preserve manufacturers, following the death of the previous chairman, Mr. J. R. Weir.

*

MR. H. C. MACFARLANE, principle of Harrison and Self, has been appointed public analyst and official agricultural analyst for the County Borough of Northampton.

Mr. A. Grevatt

Mr. A. Schwarz

Mr. J. West

DR. E. G. WOODROOFE, director in charge of research of Unilever, Ltd., has been elected president of the forthcoming I.S.F. Congress, following the death of Dr. T. Malkin.

*

Due to the amalgamation of the Diversey-Deosan chemical and bacteriological laboratories, the following appointments have been made in the new research and development department: MR. R. E. CHANDLER, technical manager; MR. R. H. VICKERS, chief chemist; MR. T. MITCHELL, bacteriological laboratory supervisor; MR. A. SAVILLE, agricultural and hygiene section supervisor; MR. E. ROITT, industrial section supervisor. MR. A. H. WALTERS will act as scientific adviser to the company.

Obituary

MR. J. R. WEIR, chairman of James Robertson and Sons (Preserve Manufacturers), Ltd., has died. Mr. Weir, a grandson of the founder of the company, was with Robertsons for 40 years, 25 of them as managing director of the Paisley factory.

*

MR. H. B. NICHOLSON, a former president of the Coca-Cola Co. and the Coca-Cola Export Corp., has died. He had recently retired as chairman of the executive committee of the Coca-Cola Co.

MR. G. S. BISHOP, deputy secretary of the Ministry of Agriculture, Fisheries and Food, has resigned from public service to take up a commercial appointment. He has been succeeded by MR. R. G. R. WALL.

*

MR. J. E. LEA, general manager of Lea and Perrins, Ltd., has been appointed to the board of directors.

Mr. W. G. Norris

Leonard Hill director to visit U.S.A.

W. G. Norris, Editorial Director of the Leonard Hill Group of Publications* will visit New York and Washington, October 2 to 20. He looks forward to meeting readers and advertisers of FOOD MANUFACTURE and invites correspondence to this end.

His address is Leonard Hill House, Eden Street, London, N.W.1.

* *Food Manufacture*
Manufacturing Chemist
Automation Progress
Building Materials
Chemical and Process Engineering
Conferences and Exhibitions
Corrosion Technology
Dairy Engineering
Fibres and Plastics
Paint Manufacture
Petroleum
Public Works and Muck Shifter
World Crops

Mr. C. W. Rodd (left), *chairman of T. Wall and Sons, Ltd., presents a block of ice, representing a refrigerator which was given as a retirement present, to Mr. Bill Haskell who has served 33 years with the company, 19 of them in the meat preparation department.*

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... is simplicity itself. You need only dial HYDe Park 0061 for Disinfestation Services and flies cease to be a problem—in kitchens, restaurants, public rooms, in canteens, shops, hospital wards—in fact wherever positive, completely efficient, permanent control of flies is essential. Due to remarkable new developments in fly control during the last 12 months Disinfestation can now provide a reliable and completely effective service to keep your premises free of flies.

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OVERSEAS NEWS

AUSTRALIA

Foster Clark merger

The merger of Great West Processed Foods Pty., Ltd., with the British firm of Foster Clark, Ltd., has been settled by an exchange of shares, but the value of the deal has not been disclosed.

Increased egg powder exports

According to the Australian Egg Board, exports of egg-pulp and powder increased sharply in the past year. Exports to Britain were expected to earn Australia more than £A5 million.

CHINA

Export drop factor in fats market

The three most striking elements of the current situation in the fats and oils world market are the scarcity of China's export supplies, the large supplies and low prices of copra and coconut oil, and the increased support price announced for the U.S. 1961 soya bean crop. Chinese entry into world markets to buy certain vegetable oils and oil seeds confirmed rumours that exports this year would be well below average, due to poor harvests on the mainland.

DOMINICAN REPUBLIC

Sugar technology training

The new course in sugar technology run by the University of Santo Domingo is now in its second year with 41 students. The school is closely linked to the sugar mill and refinery at Rio Haina, where practical study is carried out.

GERMANY

Milk consumption decrease

Vending machines have been introduced to encourage more people to drink more milk, after the drop in consumption lately.

GHANA

German oil presses

Five oil presses have been ordered from Ernst Thalmann Werke to be erected in Denu, Tamale, Asasewa, Attebubu and Bolgatanga, under contract to Indusco, the State-supported co-operative.

Russian experts discuss a machine on the Baker Perkins (Exports), Ltd., stand at the British Trade Fair in Moscow with Mr. Rodman (extreme right), *the divisional manager of Baker Perkins (Exports), responsible for Russian and Eastern European territories.*

INDIA

Milk supplies to city

A scheme has been started in Madya Pradesh to improve the supply of milk to urban centres. It will cost about £6 million and provide good quality milk to people at reasonable prices. Several creameries will be set up in villages, for the manufacture of butter and ghee (a cooking medium of clarified butter).

INDONESIA

Protein from soya beans

Dr. E. H. Tichauer from the University of New South Wales has been asked by the U.N. Children's Fund to increase the output and quality of a plant producing a soluble powder, saridele, from the soya bean, which is comparable in protein content to milk. The Indonesian government planned distribution of 2,500 tons of saridele to mothers and children, free of charge.

ITALY

Heinz form new company

An Italian company, H. J. Heinz S.p.A., has been formed and will have its headquarters in Milan under the managing directorship of Mr. O. A. Pio.

Exchange agreement

A technical and commercial agreement has been reached between Nestlé Alimentana S.A. and Locatelli S.p.A. of Milan, covering exchanges of information and experience in manufacturing and research, as well as commercial co-operation to make use of the two company's varying degrees of strength in the markets of the Six and the Seven.

HOLLAND

Icing machine

N.V. Benier, a bakery machinery manufacturer, has produced an icing machine for covering a variety of products, such as biscuits, cakes, bars, marzipan, bonbon fillings, etc. They can be wholly or partly covered, depending on the rapidly exchangeable covering guides used. The products can also be iced underneath after they have been turned automatically. The machine is fed by means of a grid-type conveyor belt which lets through any crumbs and transfers the products to two successive vibrating grid-type conveyors.

JAPAN

Mushrooms combat cancer

Scientists have discovered a substance in mushrooms which they claim can combat the growth of cancerous cells. The substance was extracted from ground mushrooms by using acetone and methyl alcohol. They also found that most of the 700 species of mushrooms examined contained this substance, and believe that mushrooms eaten at meals should help to check growths in humans. They are now trying to extract this substance in crystal form to determine its chemical composition, after which tests will be made on humans. Tests have already been made on mice.

KENYA

Sugar production

White, refined sugar which can be used domestically or in the production of aerated waters, soft drinks, preserves and jams, for which refined sugar has had to be imported in the past, will be produced by the Miwani Sugar Co. at its factory near Kisumu.

NEW ZEALAND

Increase in grain milling

The production value in the grain milling industry rose in 1959/60, the main increases being in the production of flour, oatmeal and cereals in flake, puff and biscuit form. There was also an increase in the quantity of wheat and oats milled in the same period.

Research ship

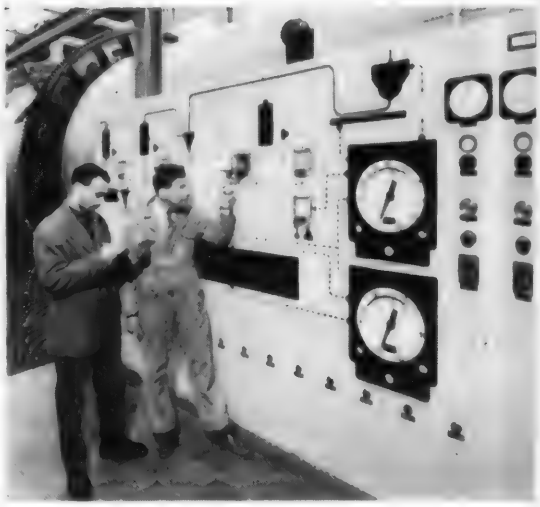
The *Sydney Star* which sailed from New Zealand for Dunkirk in May has been equipped with a specially-built laboratory for Sir Ernest Marsden, a nuclear scientist, who will study samples of radiation-affected food, soils and plants from Niue Island, and who recently reported on the ability of the islanders to withstand abnormally high radiation on their home territory. The steel ship forms a screen from outside radiation, and the relatively high natural interference from land radiation will be absent.

NORTHERN IRELAND

Egg vending machine

A Co. Down poultry farmer has installed the country's first vending machine for eggs. The machine, which works mechanically, being operated by inserting a coin and pressing a lever, sells standard eggs in half-dozen cartons, but additional machines containing a "family pack" of two large, two medium and two standard eggs are planned. The eggs are changed daily and none are sold which are older than 16 hr.

A. Shahidpour, chief instrumentation engineer at Shiraz beet sugar refinery, Persia, learns automation techniques from L. Herrema, chief instrumentation engineer at the Ely refinery of the British Sugar Corp. Shiraz is to have Honeywell automatic control equipment giving 1,500 tons a day output.



RHODESIA AND NYASALAND

Dried milk customs duty

Customs duty on dried milk entering the Federation is to be increased to protect the local industry which is being established in Salisbury by a plant of the Nestlé group.

SOUTH AFRICA

Citric acid plant

A £500,000 factory for the production of citric acid will be erected on the Natal North Coast within the next 12 months. The plant, which will be built by a German firm, is expected to give South Africa about £400,000 a year in foreign exchange.

SWEDEN

International Association of Seed Crushers

In the president's address given in Stockholm, reference was made to abnormal speculative activities which may have been a factor in forcing up prices to a point where U.S. oils, particularly soya beans, became overpriced for European requirements. Margarine consumption has increased at prices indicative of its special nutritional value and consumer acceptance, even though there has been an excess of butter stocks.

SWITZERLAND

Plans for the 1962 session at IMEDE are now complete and European firms are invited to be represented by their young executives. A maximum number of 50 participants has been set and information can be obtained from the director, Management Development Institute, P.O. Box No. 306, Lausanne-Gare, Switzerland.

UGANDA

New tea factory

Work has begun on a new tea factory at the Ankole Tea Estate. This is a joint venture by Agricultural Enterprises Ltd., the Ankole Native Government and the Uganda Co., Ltd.

U.S.A.

Fish canning

A basic process and the required machinery for canning many species of fish previously considered unsuitable for canning by conventional methods has been patented. This process provides packers with the simultaneous capability of canning tuna bonito and other varieties of fish usually restricted to a separate cannery operation. All products manufactured by use of this method are claimed to be of uniform high quality.

U.S.S.R.

Inflatable grain storage depot

The plastics laboratory of the Academy of Architecture and Building Construction has produced an inflatable depot made of synthetic or impregnated cotton fabric, which has a storage capacity of 500 tons. A new design to hold 3,000 tons is already on the drawing boards. When folded, the "tent" occupies no more than 2 cu. yards, and it can very quickly be made ready for use.

YUGOSLAVIA

Foreign substances in food

The VIIth Symposium on Foreign Substances in Food is to be held in Belgrade from October 11 to 17, 1961, and will discuss repercussions of packaging, conditioning and transportation methods on the hygienic qualities and organoleptic properties of food.

Number 36 August 1961

Glossary of Terms (cont.)

LODERS and NUCOLINE LTD.

INFORMATION BULLETIN

This advertisement is one of a series of Information Bulletins issued by Loders & Nucoline Ltd. Copies are available, together with a folder, on request to Loders & Nucoline Ltd., Unilever House, London, E.C.4.

Expelling (See Bulletin numbers 8 and 9)

A continuous process for obtaining oil from oilseeds by crushing in a screw press (or "expeller").

Fat

A Fat is a mixture of triglycerides (see Esterification) which is solid at normal temperatures.

Fat Bloom

The term Fat Bloom is applied when the fat in a chocolate or chocolate-type product disassociates itself from the mixture and appears as a white deposit on the surface.

Flow Point (See Bulletin number 19)

The Flow Point is associated with the drop point and is the temperature at which the first drop begins to form in the orifice of a special cup holding a sample of fat when heat is applied. (Refer also to definition of Melting Point).

Fondant

Fondant is a mixture of sugar, glucose and water which is normally boiled to a temperature of 238 to 240°F, allowed to cool, and then stirred in order to promote crystalisation.

Fractionation

An oil or fat normally consists of a number of fractions, each of which has different physical characteristics. Fractionation is the separation of selected fractions with the object of obtaining a product with different physical characteristics from the original fat.

Free Fatty Acid

The combination of fatty acids with glycerol to form glycerides is sometimes reversed resulting in the presence of uncombined or free fatty acids. These are usually found in crude oils and may be removed by neutralisation.

Glyceride

More strictly, triglyceride, which is an ester formed by the combination of one molecule of glycerol and three molecules of fatty acid. Glycerides occur naturally in oils and fats.

Groundnut Oil (See Bulletin number 5).

A liquid oil present to the extent of 45 to 48% in the decorticated seed of the arachis plant.

Hydrogenation (See Bulletin number 12).

Oils and fats which contain unsaturated fatty acids may have these changed to saturated acids by combination with hydrogen. This hydrogenation raises the melting point.

Hydrolytic Rancidity

Hydrolytic rancidity is a type of deterioration of oils and fats which results in the formation of free fatty acids which may be detected by a harsh flavour and increase in acid value.

Hydroxyl Group

A group which is made up of oxygen and hydrogen and which allows combination with acids to take place. An example is glycerol. This contains three hydroxyl groups which will combine with three molecules of fatty acids to form triglycerides.

Hydroxyl Value (See Bulletin number 17)

The hydroxyl value is a measure of the free hydroxyl groups present in an oil or fat.

Illipe Butter (See Bulletin number 6).

Illipe butter is an edible fat, resembling cocoa butter, which is obtained from the seeds of a number of plants growing in Borneo and surrounding districts. It is also known as Borneo Tallow.

Iodine Value (See Bulletin number 16).

This is a measure of the degree of unsaturation in oils and fats.

LN 81 8058

Luwa

Thin-Layer Evaporator

For EVAPORATION ● CONCENTRATION
DISTILLATION ● DEODORISATION

of all heat-sensitive liquids in any range of temperature, vacuum or capacity.

The modern Luwa system ensures for you the highest product quality, improved yields and the advantages of rapid continuous processing.

Why not take advantage of our great experience in the treatment of heat-sensitive liquids. The superiority of the Luwa Evaporator has been proved in the manufacture of many products including:

Dyestuffs ● Urea
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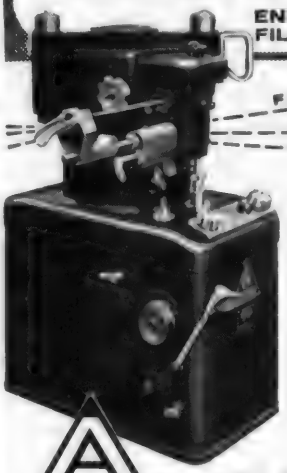
FILLING a great need

END LABORIOUS HAND FILLING OF SAUSAGES!

FAST OPERATION
ACCURATE WEIGHING
NO WASTAGE



At last sausage making is fully automatic. Just press a button on the A.B.R. filler linker and you can produce up to 200 sausages a minute! There's absolutely no wastage or contamination. No oil can reach the meat and there are no crevices for the meat to pass through. The machine is adjustable to suit any type of casing or sausage meat. An automatic holding device can be supplied for synthetic casings.

Anyone can operate or maintain the A.B.R. filler linker—it has automatic lubrication and only three grease nipples requiring once-monthly attention. Two sizes: 110 lb. and 155 lb.

40 lb. FILLER
Ideal for the small manufacturer. Takes hard, deep-cooled or soft sausage mixes. Knee-action lever for easy control. Single- or 3-phase motor.

A B R *Automatic*
FILLER LINKER

Other machines include: BOWL CHOPPERS, MINCERS, BAND SAWS, FAT DISPENSERS, CLARIFIERS, ETC.

To AMASAL LIMITED, Butchers' Supplies Division, Caldwell Spice Mills, Nuneaton, Warwickshire. Tel: Nuneaton 4012

AN Amasal COMPANY

Please send full details of the A.B.R. AUTOMATIC FILLER LINKER without obligation to:

NAME ..... **ADDRESS** .....

Please tick size req'd. 155 lb. ☐ 110 lb. ☐ 40 lb. ☐ F.M.

STAINLESS STEEL *Jam Bogie*

The illustration shows a bogie with stainless steel container in mild steel cradle which is typical of our large range of hygienic equipment specially made for food manufacture and processing.

Specialists in Fabricated Metal
STAINLESS STEEL, MONEL METAL, COPPER and ALUMINIUM

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Will automatically imprint code-dates or contents on large or small cartons or paper sacks. Several models available to suit different applications.

BASELOCK PRINTING ROLLER

Automatically re-inks the type after each impression. Uses BASELOCK rubber type in any size.

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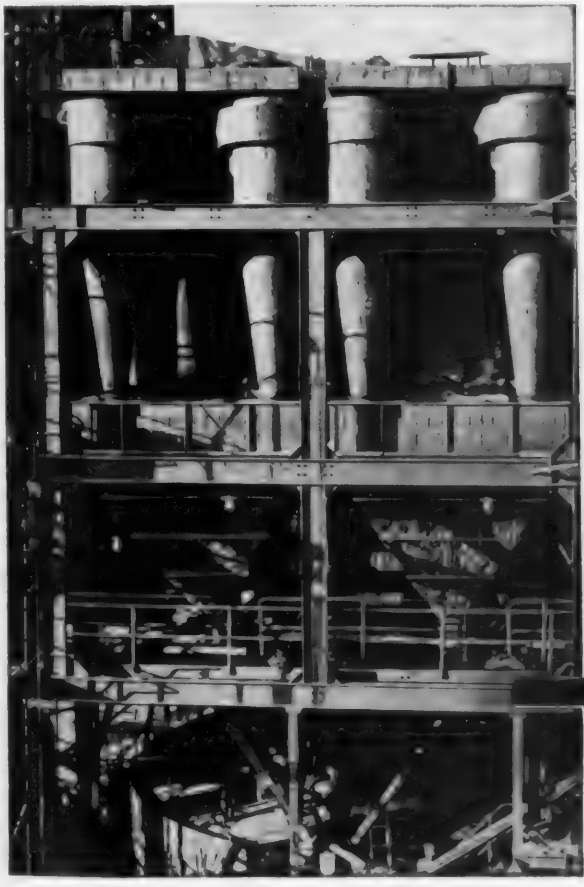

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Regd. Trade Mark

Dust Collection and Removal

The Buell range of dust collecting equipment, employing the Van Tongeren system, effectively deals with problems of industrial dust collection, either for preventing atmospheric pollution, to salvage valuable constituents in exit gases, or as part of process work.

Our experience of such work enables us to design plant which will *efficiently* deal with all types of dust from industrial and chemical plant.

The illustration is one of three installations for Joseph Crosfield and Sons Ltd. of collectors applied to a spray dryer.

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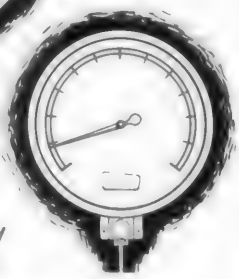

You can be quite remotely and absolutely positive about tank contents by using one of the Normond range of hydrostatic gauges.

remote?

Position the gauge indicator where you will, on or away from the tank, in the most convenient position for your readings.

positive?

Rely on Normond gauges. They are easily fitted, robustly constructed and proven completely accurate.

NORMOND TANK CONTENT GAUGES

THE MINIMETER

Specially for domestic or smaller industrial application. Gives remote indication. Hydrostatic principle. Quickly fitted. Supplied with P.V.C. tubing and balance chamber—£6 10s. 0d. retail—send for leaflet.

For larger installations

There is a range of Normond Gauges suitable for Water Works, Dairies, Gas Works, etc. Remote indication, hydrostatic principle, quickly fitted. 4½", 8" and 13" models. Calibrated in units of height, weight or capacity.

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LFC

Over thirty-five years ago, LFC began the scientific extermination of insect pests. During that time, many similar organisations have come and gone. Many patent remedies and do-it-yourself ideas have been tried and discarded. Getting rid of insect pests in factories, warehouses, ships and stored produce is not a simple job. It must be thorough. It must be safe. It should cause no drastic upset to the routine or the goods. It takes years to be good at this job. It takes thirty-five years to be as good as LFC. Expert advice is yours for the asking—advice based on thirty-five years' experience of all forms of insect pest extermination by lethal gases and every other modern method.

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181 EASTON ROAD, BRISTOL 5. *Bristol 58521*
NORTHERN CHAMBERS, 25 QUEEN STREET, HULL. *Hull 35230*

INSECT EXTERMINATION BY EVERY MODERN METHOD

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MANCHESTER
BARTON DOCK ROAD
URMSTON
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BULK HAULAGE
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PICKFORDS

TANK HAULAGE SERVICE

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LONDON, E.15
(*Maryland 3064/7*)

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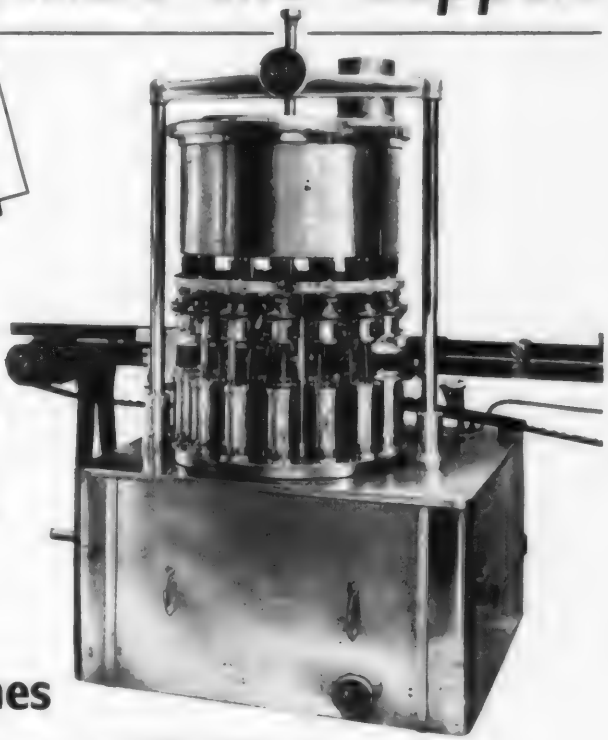
BIG, dustless output for powders



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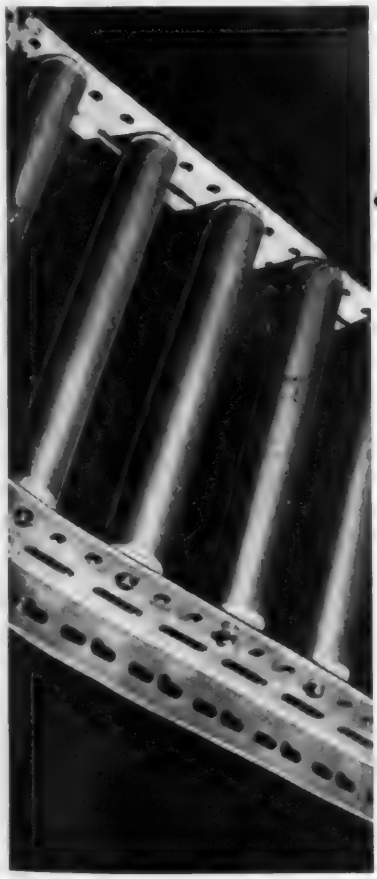

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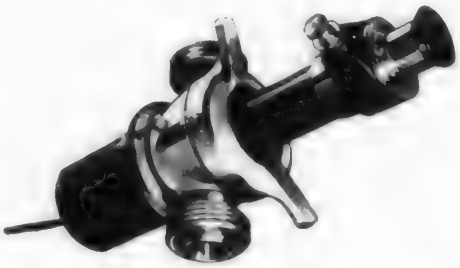

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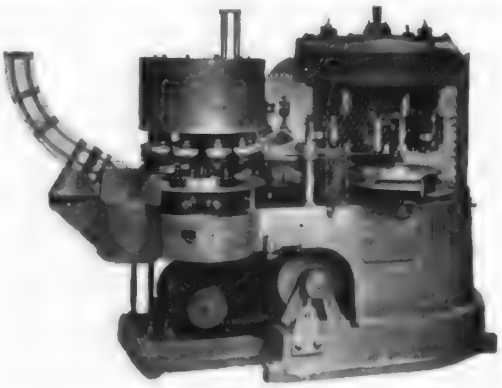

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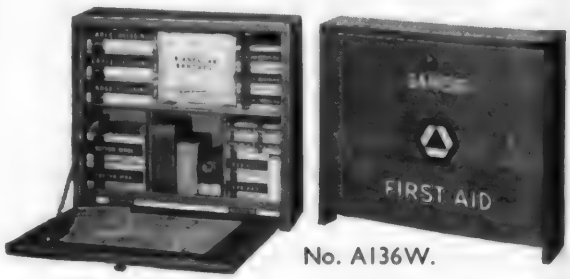

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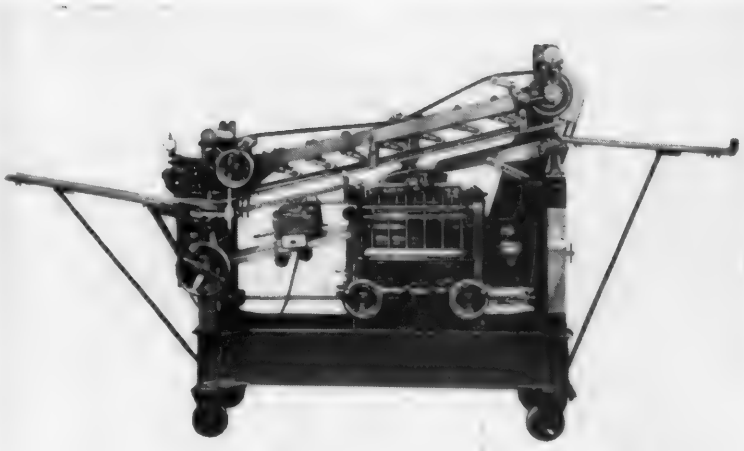

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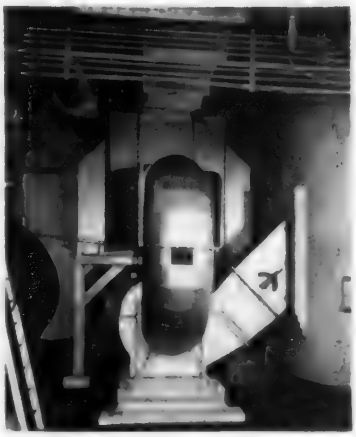

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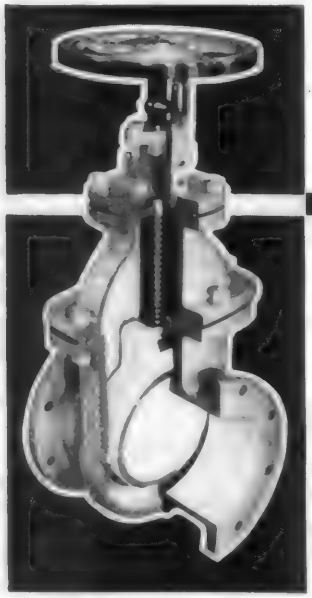

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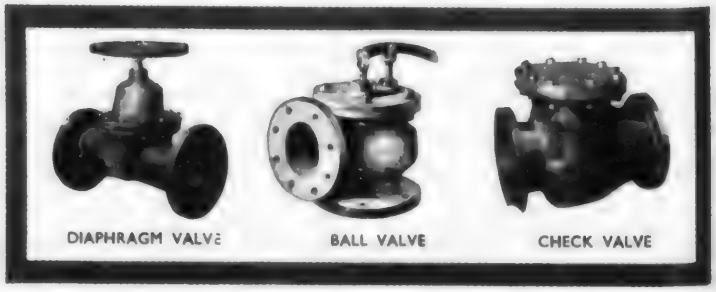

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All applications will be treated in strict confidence.

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Candidates should send full particulars of age, qualifications and experience to:

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Applicants should have some practical knowledge of meat and bakery products. A theoretical scientific background would be advantageous. It is felt that applicants under 25 are unlikely to qualify. Applications, giving full details of age, experience, technical qualifications and salary required to:

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Ref. A.986. British. Male. Single. Age 57. Inter. B.Sc. Econ., M.I.C.E., M.I.Struct.E., M.I.P.H.E., 2½ yrs. Designer & 2 yrs. Senr. Engr. (power station), consultants. 1 yr. Resident Engr., Sewage Works, local authority. 1 yr. Senr. Design Engr., (nuclear power factories, steel mills), consultants. 10 mnths. Chief Civil Engr., (nuclear power station), contractors. 6 mnths Chief Civil & Structural Engr. (oil refineries, nuclear power), Ministry works—consultants. 2 yrs. Resident Engineer supervising construction & testing of 2 cement factories abroad, consulting engrs. Seeks post as **CHIEF CONSTRUCTION CHIEF DESIGN ENGR., WORKS MANAGER OR CONTRACTOR'S AGENT.** U.K. or abroad—Iran pref. U.K. salary £2,250 p.a.

Ref. B.151. British. Male. Married. Age 33. M.A. (Cantab) Natural Sciences, M.Sc. (Mycology), M.I. Biol. Fluent Spanish. 6½ yrs. Plant Pathologist (Head of dept.), commodity research inst., Far East. 2 yrs. Head, plant Pathology Dept., international agric. chem. concern in S. America. At present Deputy Director Agric. Experimental & Advistory Service, international agric. chemical company. Thoroughly conversant all aspects tropical agricultural research & extension service administration, handling of budget, prod. of films, radio programmes & publications. Seeks **APPOINTMENT IN EXECUTIVE CONSULTANT CAPACITY IN COMPANY WITH OVERSEAS AGRIC. INTEREST,** pref. based S. England with overseas travel. £2,000 p.a. min.

Ref. B.424. British. Male. Married. Age 39. A.R.I.C. 5 yrs. Experimental Asst., explosives research—chem. control of explosives 3 yrs. Chemist/Operator oil-prod., refining & distbtn. 2 yrs. Senr. Chemist/Chief A.I.D.' Inspector, metal-finishing & pretreatment. At present Deputy Chief Chemist, mnfg. elec. equipt. Wide exper. genl. chem. analysis. Seeks post as **CHIEF CHEMIST OR DEVPT. CHEMIST.** S. London, Sussex, N.W. Kent, or N.E. Surrey. £1,750 p.a.

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Ref. B.435. British. Male. Single. Age 24. C. & G., 5 yrs. Apprentice. At present Jig & Tool D/man, vehicle mnfr. Exper. engine rectification, prod. planning & tool devpt. Seeks post as **TECHNICAL REPRESENTATIVE,** U.K. or abroad. £1,000 p.a.

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Ref. A.917. British Male. Married. Age 35. B.Sc. (Physics & Maths). Inter. B.Sc. (Hons.). Stud. Member I.S.M.A. Fellow Physical Society. 11 yrs. Asst. tech. Sales Manager, scientific instrument mnfrs., includg. 3 yrs. with Canadian agents of company. 4 yrs. Sales Manager, scientific instrument mnfrs. At present Technical Consultant, scientific instruments sales. Seeks post as **TECHNICAL OR EXPORT SALES MANAGER.** London, Canada or U.S.A. £2,000 p.a. min.

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(continued overleaf)

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Ref. B.447. British. Male. Married. Age. 32 H.N.C. Bldg. & Civil Engg. Grad. Inst. Struct.E. 3 yrs. Foreman Joiner, bldrs. 7 yrs. Foreman & Clerk of Works, govt. dept. At present Structural Designer, structural steel mnfr. Consid. exper. site supervision, estimating, work measurement, genl. bldg. design. Seeks post as **STRUCTURAL DESIGNER OR CIVIL ENGINEER.** London or Watford. £1,200 p.a.

Ref. B.448. British. Male. Married. Age 29. H.N.C. Mech. Dip. in Refrigeration. C. & G. Full Tech. Cert. in Refrigeration. A.M.Inst.R. 5 yrs. Technical Trainee, refrigerator mnfr. 5 yrs. Refrig. Mechanic, army. At present Experimental Engr., mnfr. refrigerating equipt. Consid. exper. supervision of instlln., maintenance & repair refrig. equipt., & of large cold store & ice making plant. Seeks post as **REFRIGERATION ENGR.—TECHNICAL OR ADVISORY.** Central or N.W. London. £1,250/ £1,400 p.a.

Ref. B.449. British. Male. Married. Age 30. 2 yrs. Sales Correspondent/Asst. Buyer, battery mnfrs. 5 yrs. Buyer, furnace mnfrs. & genl. sheet metal & machining. Seeks post as **BUYER (ENGG.) OR SALES REPRESENTATIVE.** Hampshire/ Surrey/Sussex. £850/£1,000 p.a.

Ref. B.450. British. Male. Married. Age 32. H.N.C.Prod.E. 1 yr. Detail D/man, civil engg. 3½ yrs. Devpt. D/man, telecomm. & electronic engg. 2 yrs. Designer & 3 yrs. Section Leader, mech. design section, electronic & microwave engrs. At present Section Leader, electronic, microwave & light precision engg. Seeks post as **DESIGN ENGR./ LIAISON** between elec. & electronic design & D/O for Mech. Design. U.K. £1,400 p.a.

Ref. B.451. British. Male. Married. Age 32. B.Sc. (Applied Chem.), Ph.D. (organic chem.). 2½ yrs. Devpt. Chemist, medicinals mnfr. At present Prod. Chemist, fine chemicals mnfr. Seeks **CHEMICAL PROD./PLANT OR PROD. MANAGEMENT POST.** £1,600 p.a.

Ref. B.454. British. Male. Married. Age 33. H.N.C., A.M.I.Prod.E. 11½ yrs. Apprentice/D/man/ Planner/Estimator, aircraft mnfr. At present Chief Prod. Engr., ceramic resistor mnfrs. Seeks post as **ASST. WORKS MANAGER/PROD. MANAGER/ PROD. ENGR.**—not aircraft industry. Kent, Surrey, Sussex, Berks, Bucks or Hampshire. £1,500 p.a.

Ref. B.456. British. Male. Married. Age 33. H.N.C. (Mech. Eng.), A.M.I.Mech.E. 2 yrs. Workshops Trainee, precision engrs. 3 yrs. D.O. Training, genl. mech. engrs. 5 yrs. Design Officer, paint mnfrs. 5 yrs. Project Engr., nuclear engg. At present Project Engr., nuclear engg. Good knowledge chem. plant & pressure vessel design. Seeks post as **PROJECT OR DESIGN ENGR.** London or within 30 miles radius W. of London. £1,600 p.a.

Ref. B.457. British. Male. Married. Age 31. Hons. Dip. Agric. Eng., 1st Class Dip. Automobile Eng. with hons. for practical work. C. & G. Motor Vehicle Technicians Work (Advanced) Cert. 1 yr. Pupil Farmer. 1½ yrs. Tractor Driver/Mechanic, agric. committee & agric. contractor. 10 mnths. Tractor Driver/Mech., inst. of agric. botany. 6 mnths. Mechanic/Welder, motor engr. 2 yrs. Managers Asst., motor garage. At present Field Officer (Agric.), Officer i/c Workshops of special devpt. section of govt. agric. dept., Africa, concerned with devpt of new forms of agric. m/cy. Seeks **AGRIC. OR AUTOMOBILE ENGG. POST**—Devpt. & Modification of existing designs/Workshop Manager/ Maintenance Engr. Australia—pref. Queensland. £2,000 p.a.

Ref. B.458. British. Male. Married. Age 38. O.N.C. Elec., H.N.C. Prod. Engg., A.M. Oil & Colour Chemists. 6 yrs. Engg. Trainee, 6 mnths. Tech. Engr., 1 yr. Prod. Engr., 8 yrs. Devpt. Engr. & 4 mnths. Senr. Project Engr., & consultant, electro/ mech. engrs. At present self-employed Consultant Engr. Holds several patents mostly applications of plastic materials, electro/mech. component construction. Seeks **PRODUCTION DEVPT. OR MANAGEMENT POST.** London or Home Counties.—pref. Herts or Surrey. £1,500 p.a. min.

Ref. B.459. British. Male. Married. Age 45. Matriculation distinctions maths, physics, chem. 3 yrs. Junr. Clerk, 2 yrs. Claims Settlement Broker, insurance brokers. 1 yr. Correspondence/Acturial, insurance brokers. At present Company Director—buying, management, costing, cash control—scrap metal processors & merchants. Consid. exper. Estimating & Negotiation of contracts, costing, instlln. of new processes, yard & personnel management, plant maintenance & renewals, cash control & private ledger. Seeks **EXECUTIVE/MANAGERIAL POST.** U.K. £1,200 p.a.

Ref. B.460. British. Male. Married. Age 36. O.N.C., H.N.C. Mech. Eng. with endorsements Workshop Technology, Principles of Elec., Theory of m/cs. & Industl., Administration. 5 yrs. Apprentice, & 2 yrs. Junr. D/man, aircraft constructors. 4 yrs. Devpt. D/man, motor & aircraft engrs. 2 yrs. Design D/man, bldg. plant mnfrs. 2 yrs. D.O. Checker. At present Senr. Designer, mnfr. electronic & electro-mech. equipt. & instruments. Seeks post as **SENR. MECH. OR ELECTRO-MECH. DESIGNER.** S.W. London or Surrey. £1,100 p.a.

Ref. B.461. British. Male. Married. Age 45. Dip. Hort. with distinctions. A.M.I. Biol., A.I.Agr.E. 3 yrs. Manager, market gardening. 1 yr. Horticultural Instructor, agric. instruction. 3 yrs. Horticultural Adviser, land settlement. 3 yrs. Hort. Advisory Officer, agric. instruction. 12 yrs. Vice-Principal, horticultural instruction. At present Senr. Lecturer in Horticultural & Soil Science, agric. & hort. training, & consultant (part-time) in soils & manures & direct trials for agric. consultants. Author of several published books. Seeks post as **CONSULTANT OR INDUSTL. LECTURER.** U.K.—not London. £2,000 p.a.

Ref. B.462. British. Male. Married. Age 35. O.N.C., H.N.C., Inter. & Final Dip. in Mang. Studies & endorsements. A.M.I.Mech.E., Grad.I. Prod.E. 4 yrs. Apprentice & 2 yrs. Junr. D/man, mech. engrs. 1 yr. Tech. Asst., pump mnfr. 3 yrs. Planning Engr., chem. plant mnfr. At present Mech. Engg. Design Engr., consultants—mech. & chem. engrs. Seeks post as **PERSONAL ASST.** U.K. £1,300 p.a.

Ref. B.463. British. Male. Married. Age 41. H.N.C. Mech. 10 yrs. Senr. D/man, commercial radio & TV. 9 yrs. Designer D/man, radio & radar equipt. 1½ yrs. Section Leader, computors. 2 yrs. Engr. (liaison), guided weapons. At present Section Leader (electro-mech. D.O.), electro-mech. equipt. mnfr. Seeks post as **D.O. MANAGER/CHIEF D/MAN/SECTION LEADER.** London area. £1,300/£1,500 p.a.

Ref. B.464. Indian. Male. Single. Age 23. *Resident U.K.* B.E. (Elect.). 6 mnths. Junr. Engr., allocation of H.T. Loads, maintenance of load records, problems of generation & transmission of electricity. 1 yr. Asst. Engr., preparation estimates for cable laying & plant instlln. Just completing post-grad. course & seeks **PROD. POST—PREF. IN CABLE INDUSTRY.** U.K. £750 p.a.

Ref. B.465. British. Male. Single. Age 26. H.N.C. Mech. Eng., G.M.I.Mech.E. 6 yrs. Apprentice, maintenance engg. At present Devpt. Engr., control engrs. & instrumentation. Design office & admin. exper. Seeks post as **PROJECT ENGR.** London. £1,100 p.a.

Ref. B.466. British. Male. Married. Age 35. O.N.C. & H.N.C. Mech. & endorsements. Grad.I. Mech.E. 1½ yrs. M/c Setter, munitions. 1 yr. Fitter, portable electric tool mnfr. 4½ yrs. Aircraft Engr., airline operators. 5 yrs. Research Engr., diesel fuel injection mnfr. 3½ yrs. Research Engr., mining research. At present Research Engr., steam & instrument engrs. Seeks post as **RESEARCH ENGR.** Pref. within 20 mile radius of Chichester. £1,175 p.a. min.

Ref. B.467. British. Male. Married. Age 36. O.N.C Mech. Eng. 17 yrs. From Apprentice to Senr D/man i/c plotting table, radar ground to air plotting table. 2 yrs. Section Leader of design D/men—with some prod. engg. & liaison duties—instrumentation of rocket site. At present Senr. Design D/man (Mech.) Research, research into medical & pneumatic equipt. Seeks post **"OFF THE BOARD" WITH GOOD ADMINISTRATIVE PROSPECTS.** Within 20 mile radius of Chichester. £1,200 p.a. min.

Ref. B.468. British. Male. Married. Age 27. O.N.C. Mech., 1st yr. H.N.C. Mech. 5 yrs. Apprentice, genl. engg. 1 yr. Jig & Tool D/man & 2 yrs. Tech. Service Engr., air conditioning & refrig. equipt. for aircraft industry. At present Asst. to Sales Manager, equipt. for handling of liquids in bulk. Seeks **TECHNICAL REPRESENTATION/ LIAISON POST.** London, Home Counties or S. Coast of England. £900/£950 p.a.

Ref. B.469. British. Male. Married. Age 30. B.Sc. (Chem.). 3 yrs. Chemist, consulting & analytical chemists—bldg. & struct. engg. materials. At present Senr. Chemist, mnfrs. specialised polymer compounds. Consider. exper. i/c of R. & D. laboratory. Seeks post as **SENR. CHEMIST.** U.K. £1,600 p.a.

Ref. B.471. British. Male. Married. Age 26. Inter. B.Sc. Physics & Chem. 9 mnths. Junr. Technician, biophysics research. At present Lab. Asst.(Research), plastic materials. Taking H.N.C. Chem. June '61. Seeks post as **CHEMIST.** London, £800 p.a.

Ref. B.472. British. Male. Married. Age 29. 3rd. Yr. C. & G. standard. 1 yr. Tracing & Dwg. Expr. 13 yrs. Electrician, electrical contractors. At present Electrician, elec. instlln. Seeks post as **ELECT. D/MAN.** Essex or S.E. London. £750, p.a.

Ref. B.474. British. Male. Married. Age 26. O.N.C. Mech. Eng. with Prod. endorsements. 1st. Yr. H.N.C., C. & G. M/c Shop Engg. Genl. Works Apprenticeship, followed by training & work in Plastics R. & D., & metal finishing research with special ref. to plating & effluent plant layout & design. At present Pilot Plant Supervisor, light engg. Seeks **TECH. SERVICES/LIAISON/TECH. REP. POST.** Herts./Middx. pref. but will consider elsewhere. £1,000 p.a. min.

Ref. B.475. British. Male. Married. Age 25. H.N.C. Mech. Eng., G.I.Mech.E., G.I.Prod.E., S.I.Elec.Eng. 7 yrs. Student Apprenticeship, motor car/truck mnfrs. At present Prod. Planning Engr., motor car/ truck mnfrs. Seeks post as **PROD. ENGR.—PLANNING OR MANAGEMENT.** S.W. England, India, Chile Argentine or U.S.A. £1,200 p.a.

Ref. B.476. British. Male. Married. Age 40. 2 yrs. D/man, guided missiles. 2 yrs. D/man, navigation instruments. 6 yrs. D/man, contract dwg. At present Senr. D/man, Electronic & Microwave Instruments. Seeks **ACTIVE / RESPONSIBLE POST**—not Dwg. Offices—interested Rep./Liaison work. £1,000 p.a. min.

Ref. B.477. Indian. Male. Single. Age 25. *Resident U.K.* B.Sc. (India) Chem., Physics & Maths. Just completed B.Sc. (Chem. Eng.) final yr. London University. Seeks post as **CHEM. ENGR.** U.K.—pref. London. £850 p.a.

Ref. B.478. American. Male. Married. Age 42. *Resident U.K.* A.M.I.E.E. (U.S.A.), 2nd Class P.M.G. Telegraphy Cert. 6 yrs. Operator, radio communications. 2 yrs. Elec. Motor Tester, elec. motor mnfr. 1 yr. i/c Eng. Laboratory, 2 yrs. Chief Inspector, 1 yr. Chief Quality Control, 4 yrs. Asst. Chief Engr., elect. motor mnfg., U.S.A. Good knowledge all phases of mass prod. Seeks **INSPECTION POST.** London.

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